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OCTOBER 22nd, 1942

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FLIGHT and The AIRCRAFT ENGINEER

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C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

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The Outlook

Malta's Thousandth

ON October 13th the Axis lost eight aircraft in attacks on Malta, but one of them was especially notable, for it was the thousandth enemy machine to fall to the defences of the island.

It is interesting to cast one's mind back to the outbreak of war, when a current subject of speculation was the numbers of first-line aircraft in the possession of each of the belligerents. Some people who might be expected to have information reckoned that Germany then had about 3,000. Certainly then nobody would ever have guessed that little Malta would account for over a thousand Italian and German machines. To attempt to raid that tiny triangle of land is now of the nature of a "forlorn hope." In three days of recent renewed activity the Axis lost no less than forty-eight machines.

Yet the enemy dare not leave the island alone for long. When the attacks on it relax the bombers and torpedo-aircraft set out and strike at the convoys on their way from Europe to Rommel's forces. The Navy joins in, too, with its submarines, and the heavy squadrons based in Egypt continue to hammer Tobruk and Benghazi, as well as bases in Crete and elsewhere. The Middle East Command conducts its sea operations on lines not dissimilar from those of Coastal Command, and like the latter it works in close collaboration with the Navy. Malta is one very important square on the chess board.

When Tobruk and Benghazi harbours get over-full of wrecked ships and the loss of stores grows intolerable, the Axis convoys have to make use of Tripoli, far though it is behind Rommel's front lines. That route brings the convoys very close to Malta, with inevitable consequences. That, in turn, results in renewed attempts to bomb the island into quietude, and then the deadly Spitfires take their toll, shooting down machines which the Axis is now very loth to lose.

The recent renewal of raids on or at the island are not likely to be mere exhibitions of German spite. They indicate that something or other has been brewing elsewhere, probably that Rommel is in urgent need of more supplies for some purpose, and that he has not been getting all he wants. They may mean that the Germans expect the Eighth Army to assume the offensive before long and are nervous about their ability to withstand it. Everybody in all the United Nations must hope that the Germans have guessed correctly.

Three-in-one

TALK about a second front comes from all quarters, and every responsible authority is agreed on the necessity for it just as soon as the United Nations are in a position to undertake it with sound reasons for expecting success. All are agreed that it must be a combined effort, the protagonists being the forces of Britain and the United States.

Not only must the various Allied nations work in unison on one agreed plan, but there must also be complete co-operation by the various arms of each of the nations. For us in the United Kingdom the great thing is to get all our three fighting Services working as one. In the sad old days of 1940 much criticism could be made of British shortcomings in that respect, but of late the improvement has been very gratifying. Good examples of it are seen in the Combined Operations under Admiral Lord Louis Mountbatten and in the Middle East. On another page of this issue we publish an exclusive article on the manner in which the R.A.F. Middle East Command now works with, and really under the orders of, the Army forces of General Mont-

gomery. Squadrons of the Fleet Air Arm (we also publish an article on the work of that arm in this issue) work with the Air Force and the Army in Egypt, and with Coastal Command in northern waters. On page 437 appears a photograph of an aircraft of Bomber Command sinking a U-boat, and this machine had been lent by Bomber Command to Coastal Command; while on another page the training of Army glider pilots by R.A.F. instructors is illustrated. The heads of all Services are agreed that final victory must be won not by a single Service, but by all three in unison, and confidence can now be felt that there is no danger of one upsetting the whole plan of campaign by "playing for its average" and not for the victory of its side.

The Raid on Le Creusot

NOTHING, perhaps, is better for the fighting spirit of a force than friendly emulation between corps or individuals in it. British and American bombers are the best of friends, and now they are trying to outvie each other in damaging the enemy's war effort. The American Army Air Force only the other day put up what was quite an amazing feat of daylight bombing over Lille. Bomber Command of the R.A.F. has always worked by night when it used large formations of aircraft; but none the less one can imagine the Command saying to its collective self: "The Americans (gallant fellows!) can bomb by day, can they? Well, we'll show them that we can do it, too." And Bomber Command has certainly showed that it could.

Apart from the fact of daylight, and the roughly equal number of machines sent out, the raids on Lille and Le Creusot were different in almost every respect. The former had an escort of some 500 fighters, though it hardly owed its success to them; the Lancaster raid was unescorted. The Americans flew high; the Lancasters kept as low as they could. The former raid can hardly have come as a surprise to the enemy; the latter certainly did so. They were alike in that both showed equal enterprise and gallantry, and each met with complete success.

The Lancasters met with three Arado seaplanes, evidently on their way in, and that suggests that they made their landfall from the West. If that speculation is correct, it would account in great measure for the surprise which was achieved. The German defences were caught napping, and the tactics of flying low would help in taking them unawares. The only Lancaster lost may have been brought down by debris thrown up by its own bombs.

The raid must have been a shock to the Germans, who will now be wondering what unpleasant surprise Air Chief Marshal Harris will next spring upon them. Of course, a surprise cannot always be brought off, and it would be folly to try the same thing over again. For the present it may be taken that Bomber Command will specialise on night bombing, while the Americans will do most of the concentrated work by day. It will be a fair division of labour, and should result in an all-round-the-clock attack on the German war effort both in Germany itself and in the occupied countries.

A.O.C., G.C. ISLAND.: Air Vice-Marshal K. R. Park, C.B., M.C. and Bar, D.F.C., A.O.C. Malta, in the Spitfire he uses to tour the island's airfields. He is a New Zealander and joined the R.F.C. in 1917.

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New Appointments

WITH the approval of the Prime Minister, the Minister of Aircraft Production has appointed Air Chief Marshal Sir Wilfrid Freeman, K.C.B., D.S.O., M.C., to be chief executive at the Ministry of Aircraft Production. Under the Minister he will co-ordinate and direct the production and the research and development sides of the Department.

On taking up his new appointment, Sir Wilfrid Freeman has retired from the Royal Air Force and from the Air Council, and the King has been pleased to approve his promotion to G.C.B. (Military Division) in the Most Honourable Order of the Bath in recognition of his outstanding services.

The Secretary of State for Air has appointed Air Vice-Marshal C. E. H. Medhurst, C.B., O.B.E., M.C., Assistant Chief of Air Staff Intelligence to act temporarily as Vice-Chief of the Air Staff, and has further appointed him to be an additional Member of the Air Council while serving in that capacity.

We understand that Sir Roy Fedden, chief engineer of the engine department of the Bristol Aeroplane Co., Ltd., has relinquished his position with that firm.

War in the Air

An Australian Hudson taxying to its dispersal point at an advanced airfield.

Hard Fighting in the Pacific : Kiel Heavily Raided : Malta's Deadly Spitfires

IT has often been remarked in these columns that Australia is being defended mainly by air action. The statement must not, of course, be pushed too far, for the American action in the Solomons is mainly a matter of the Navy and the Marines, though air plays its due part. New Guinea is the island which is most important to the defence of Australia, as it would provide the best base for a Japanese attack if the enemy were able to establish themselves at Port Moresby, and for some considerable time it was mainly air action which held the Japanese off. Their sudden retirement may also, in all probability, be attributed to Allied air action against their tenuous supply lines, and the repeated damage to Wairopi bridge.

At times, however, aircraft are asked to do more than they can accomplish, and one case of this sort was the recent Japanese reinforcement of their outnumbered troops in Guadalcanal Island in the Solomons. The Navy Department at Washington has stated that "Navy and Marine Corps aircraft from Guadalcanal persistently attacked these landing parties, but air attack alone did not stop the landings." Perhaps there were not enough machines available for the job in hand. Consequently, U.S. cruisers and destroyers had to take on the job. Although the U.S. Navy had lost three heavy cruisers in a short-range engagement with the Japanese Navy on August 9th, they raised enough warships for this occasion. A sharp battle was fought for thirty minutes, in which six Japanese ships were sunk, including one heavy cruiser, while the Americans lost only one destroyer. The enemy was forced to abandon his landing attempt, and withdrew.

Aircraft in Pursuit

THEN the aircraft came into the picture again, and torpedo-aircraft and dive-bombers pursued the fleeing Japanese ships. Another Japanese cruiser was hit by a torpedo from the air and afterwards by bombs, and was set on fire and stopped. Her crew abandoned the vessel. The accompanying destroyer received a direct hit from a bomb, besides near misses which may have damaged her below the water line, and she was last seen in a sinking condition. In the meantime, the American marines on Guadalcanal pressed forward and improved their positions.

A later announcement by the Navy Department in New York has stated that U.S. submarines had sunk eight more Japanese vessels, one of which was a heavy cruiser, while the others were cargo ships and tankers. Warships and naval aircraft (including machines of the Marine Corps) are working in grand co-operation in the S.W. Pacific, and this co-operation has been most profitable.

Since the above statement was published, the battle has developed, for

CHEATING DAVY JONES: The begowned figure on the right is P/O. G. E. Genders, who had to bale out over the Mediterranean. His engine stalled while he was attacking a Junkers. Supported only by his flotation jacket, he swam for 21 hours before reaching land. The native galabieh he is wearing is to replace his wet clothes. This seems to be a clear case for starting a club called the "Flying Mae West" for those who swim home.

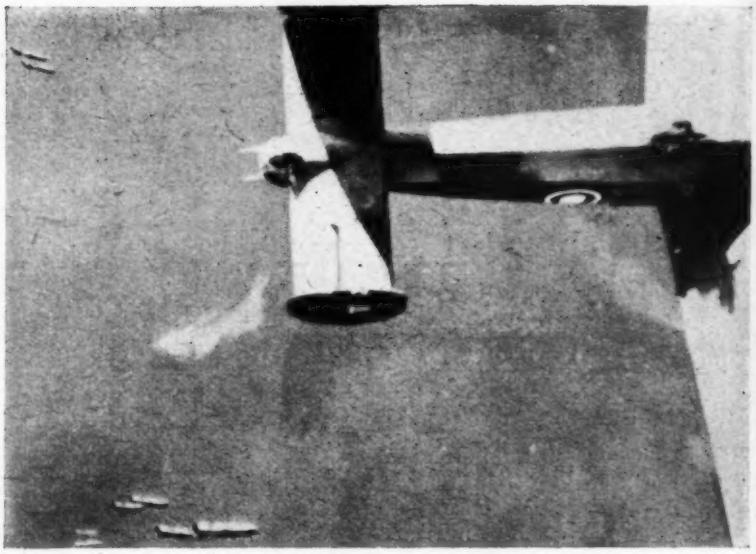
WAR IN THE AIR

the Japanese have sent more warships and transports to the area of conflict. Both sides have reinforced their troops on the islands, and U.S. Army units have landed on Guadalcanal to reinforce the Marines already there. Japanese aircraft succeeded in one bombing attack on the airfield in that island, which was not intercepted, but in a later raid the U.S. fighters shot down nine out of 15 bombers and four fighters, losing only one machine themselves. Two Japanese battleships are said to have been damaged, and the naval balance of gains and losses is well in favour of the Americans. The battle is still in progress as this page goes to press.

In the Middle East

WHEN the British forces were advancing in Libya, engineers extended the coast railway, which had previously only run from Alexandria to Mersa Matruh. The enemy has found this railway a great convenience, but not without paying a price for it. A 500-ton enemy supply train proceeding to the Alamein line carrying big guns and a huge quantity of ammunition was blown sky-high by Allied pilots one day not long ago. The train, consisting of some 20 fully laden trucks, was sighted by a small mixed force of long-range fighters and bombers. The fighters attacked first, sweeping down on the moving train and raking the engine from point-blank range with machine-gun and cannon fire. The engine was brought to a standstill in a cloud of steam, smoke and flame. Then the fighters swept down the whole length of the train, shattering the wagons with their fire. Bombers, piloted by members of the S.A.A.F., continued the attack. One bomb struck a truck, which must have been packed with explosives, for the burst of the bomb was followed by a violent explosion, and the truck, together with one next to it (which carried a big gun), was blown into the air.

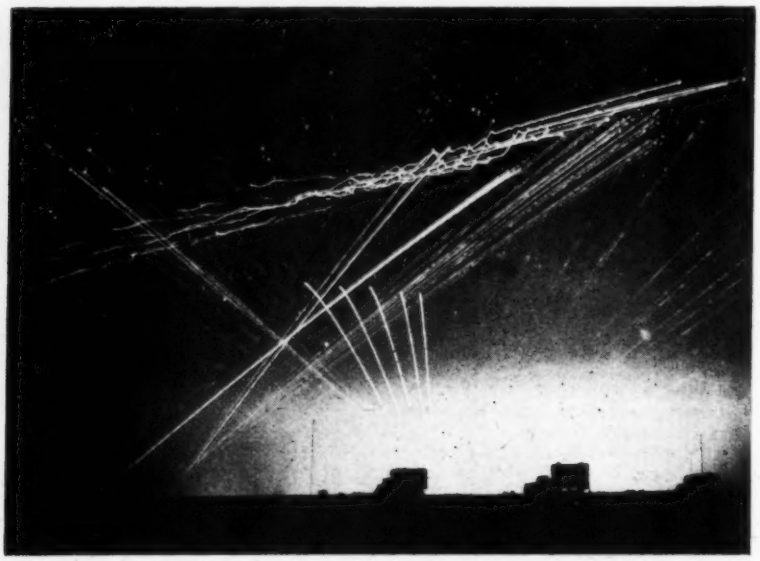
The explosion was so great that the whole train was blown off the line and completely wrecked. Describing the operation, Wing Cdr. Bragg, who led the fighters, said that he was still strafing the train when the explosion took place. "Debris was thrown hundreds of feet into the air," he reported, "and I had to take evasive action to avoid it. One piece of debris did, in fact, strike my port wing. As we climbed away, the wreckage was a mountain of flame, with smoke rising to two thousand feet."



LIBERATED: An unusual photograph showing bombs falling from an R.A.F. Liberator while attacking a convoy in the Mediterranean.

Malta Triumphant

ONCE more the Axis has made a desperate attempt to demolish the air strength of Malta. The attacking aircraft have had a bad time. Evidently the convoy which recently fought its way so gallantly through to the island brought strong reinforcements of Spitfires, and they have now been in action with deadly effect. They have flown out and met the raiders over the sea, and several times they forced them to jettison their bombs in *Mare Nostrum* and turn back towards Sicily, leaving many of their comrades behind, while numbers of others were limping back with small chance of making safe arrivals at their bases. Comparatively small formations of bombers were sent over with huge escorts of German fighters, mixed with a few Italians. The result was much the same as in the later stages of the Battle of Britain. The more targets that were offered to the guns and cannon of the Spitfires, the greater were the Axis losses. Fighter-bombers were sent against the island for the first time, but are not reported to have had more success than the true bombers. In five days' raiding the Axis lost 94 machines, while the defenders only lost a very few Spitfires, and saved the majority of the pilots. The air-sea rescue service of



A photograph of the A.A. fire put up over an R.A.F. desert airfield during a night attack. The almost straight lines of tracer shells are obvious, but the cause of the horizontal "spaghetti," which starts as a series of straight lines, is very puzzling.

WAR IN THE AIR

the island is evidently very efficient. Further victories may well be expected before these lines are in the hands of our readers.

Crisis at Stalingrad

FOR a while there was a lull at Stalingrad, which almost led one to hope that the Germans had given up hopes of capturing the town before the winter. Then the assault was renewed with greater fury than ever. Wherever the *Luftwaffe* could be used without danger of hitting German troops the air bombing was intense, and observers in Russia write that it has been the main instrument of the German successes. Its work has been systematic and very thorough.

There has also been much hard fighting in the Mozdok area, and it was significant that not long ago the *Luftwaffe* began to bomb the Grozny oilfields. They had not done so before, as very assuredly they want to capture the oil supplies intact. They do not, however, seem to have persisted with the bombing, and may well have changed their minds about the possibility of capturing the fields. At any rate, they have started a serious offensive in that direction, and have made slight progress.

BRITISH & U.S. AIR LOSSES TO OCT. 17th

	Over G.B. A'crft.	Over Continent B'brs	Over Continent F'trs.	Middle East A'crft.
Oct. 11	0	2	3	1
,, 12	1	2	0	6
,, 13	0	9	0	5
,, 14	0	0	0	5
,, 15	0	18	1	6
,, 16	0	0	0	7
,, 17	0	1	0	3
	1 (pilot safe)	32	4	33 (10 pilots safe)

Totals: West, 4,781 : Middle East, about 1,780.

ENEMY AIR LOSSES TO OCT. 17th

	Over G.B.	Over Continent	Middle East
Oct. 11	0	0	16
,, 12	0	0	27
,, 13	0	3	22
,, 14	0	0	25
,, 15	0	0	17
,, 16	1	0	8
,, 17	2	2	8
	3	5	123

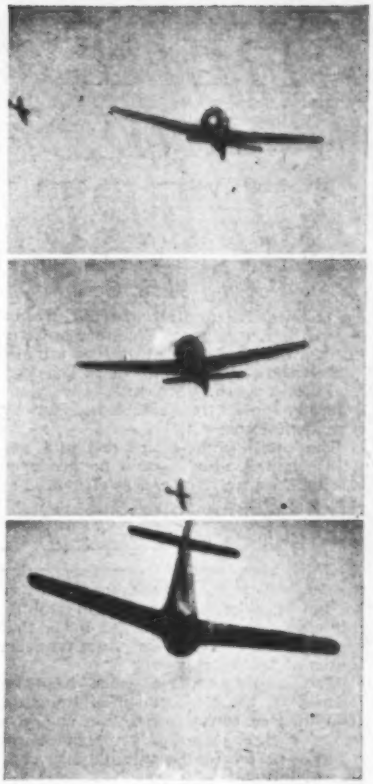
Totals: West, 6,434 : Middle East, over 4,747.

Bomber and Coastal Commands

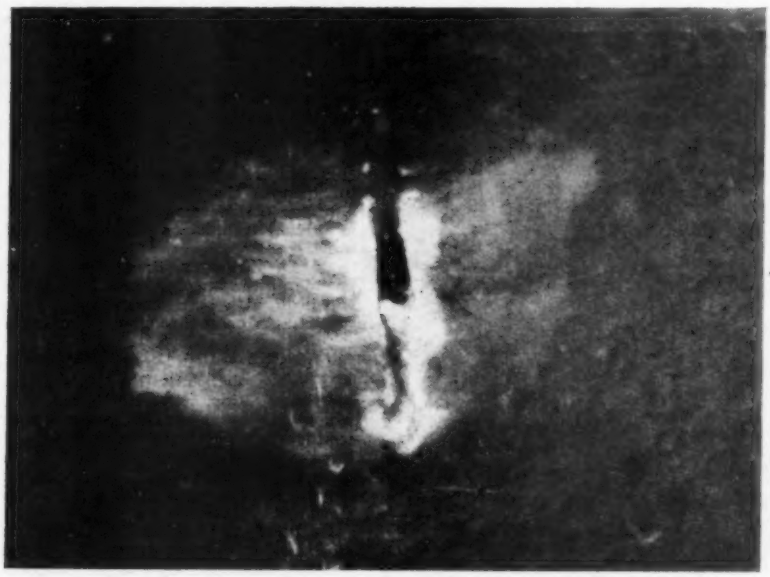
BOMBER COMMAND has done notable work since our last issue was published. An hour's raid on Kiel by several hundred bombers one night battered that very important port more heavily than ever before. There was no moon, but great numbers of flares lighted up the place, and the bombing was so intense that the defences were well nigh battered into futility. Many guns were silenced and the searchlights seemed to be thoroughly demoralised. We lost nine bombers, which cannot be called excessive for such a raid.

Then on Saturday, October 17th, a most daring daylight raid was made on the great Schneider armament works at Le Creusot, 170 miles south-east of Paris, where heavy guns and other war material were being manufactured for the Germans. The raid was made by 94 Lancasters, which flew in low, practically hedge-hopping, and discharged all their bombs within seven minutes. They had no fighter escort. Of course they climbed before bombing, but some did not go higher than 500ft., and one which was working from that height was lost. It was the only loss, and the suggestion has been made that it was brought down by debris thrown up by its own bombs. The raid was timed so that the bombs were dropped just at dusk, and the Lancasters flew home under cover of darkness. One was attacked by three Arado seaplanes, evidently on its way in, and shot down two.

A convoy has arrived safely in Great Britain which had been hunted for days by a U-boat pack. Thanks, however, to the efficient help which the Coastal Command aircraft gave to the naval escort, not a single torpedo was fired against the ships. United States Catalinas from Iceland also shared in the work. Coastal Command now is possessed of a considerable variety of aircraft, and sent out Fortresses, Liberators, Hudsons and Catalinas to keep watch and ward over the convoy. Several times the crews of one or another aircraft spotted U-boats, and attacked with bombs and machine-gun fire.

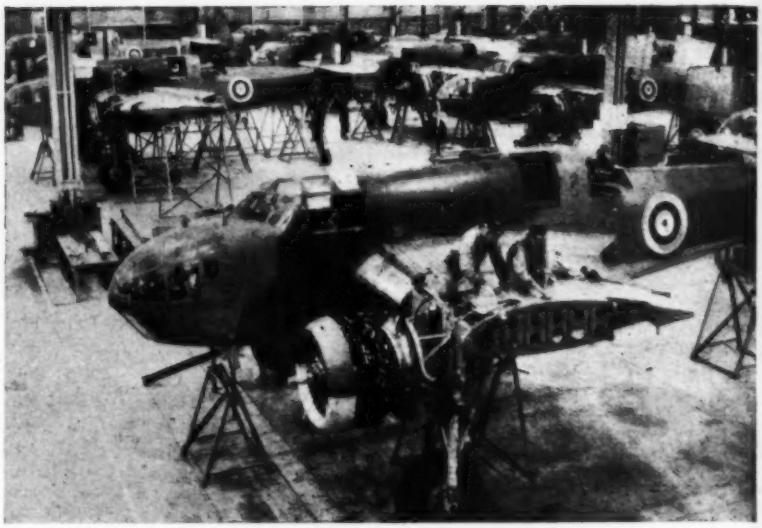


Fw END IN SIGHT: Sequence of photographs taken during a dog fight between Spitfires and Fw 190s over Northern France. The Spitfire taking the photographs is making a successful stern attack on an Fw 190 and in the background is another Spitfire diving to attack.



COASTAL-BOMBER COMMAND SUCCESS: Aircraft of Bomber Command and Coastal Command in unison recently made a successful attack on a U-boat in the Bay of Biscay. The U-boat is seen wallowing in the swirl of bombs bursting on each side of the conning tower.

HERE AND THERE



BEAUFORTS DOWN UNDER : When Australia embarked upon the production of the Bristol Beaufort two years ago, thousands of jigs had to be made and subsidiary factories built. Output is now rapidly increasing, as in this factory in Victoria.

Nearing Their Goal

ACCORDING to a recent report by the U.S. Aeronautical Chamber of Commerce, the country's output of aircraft passed the 4,000-a-month mark last May and is "pressing towards the 5,000 monthly production rate asked for by President Roosevelt."

The total value of aircraft and aircraft engines which would be produced during the present year was estimated at £1,000,000,000.

Galway Hopes Deferred

SOME time ago Galway corporation suggested the establishment of an airline between their town and Dublin, the chief argument advanced being that it would help to ease the strain on other forms of transport.

The corporation has since been informed by the Department of Industry, Dublin, that such a connection is impossible in the present circumstances as there is at present no suitable airport in the vicinity of Galway.

Yet Another

SIR FRANK SPENCER SPRIGGS, managing director of Hawker Siddeley Aircraft Co., has accepted a seat on the West-End board of the Eagle Star Insurance Co., Ltd.

He is already chairman of A. V. Roe and Co., Ltd., Air Service Training, Ltd., Armstrong Siddeley Development Co., Ltd., Armstrong Siddeley Motors, Ltd., Gloster Aircraft Co., Ltd., Hawker Aircraft, Ltd., and Sir W. G. Armstrong Whitworth Aircraft, Ltd.

Help!!!

THERE is an amusing story in a recent issue of *Wings Abroad*, the official newspaper of the R.C.A.F. published in London.

This relates how a bomber pilot, obliged to return unexpectedly early from a night raid, managed to land on the runway and, looking round for someone to guide him in, saw a light being waved, so began to follow it.

The light seemed to wander about a lot and the pilot was thinking that his guide could not know his job too well, when, having decided to stop and investigate more closely, he found he had one wheel in a row of bushes and another in an adjoining field.

The explanation proved to be that the light was in the hands of an airman who had been sent out to shoo away some cows which had strayed on the airfield, and who had been frantically trying to escape from the pursuing bomber.

Sounds a bit phoney to us, but it's a good yarn, all the same.

SCRAP FROM SCRAPS : Sorting out the different parts of German aircraft engines on a dump where the power-units of enemy raiders brought down in this country are collected. There are some 400 such contributions to our scrap metal campaign on this one.

Photographic Exhibition

SIR ROBERT WATSON WATT, of radiolocation fame, is to open an exhibition of "Photography in Industry and Science" at the Royal Photographic Society, 16, Prince's Gate, S.W.7, on October 31st. This exhibition is being promoted by the Association of Scientific Workers and the exhibits will cover a wide field and have particular reference to the war effort.

Exhibitors include the technical branches of the three Services and the Ministry of Information, in addition to individual technicians and photographic firms.

Mr. D. McMaster (Pres. R.P.S.) is to preside at the opening ceremony, which will begin at 3 p.m., and the exhibition will remain open throughout November.

The late Wing Cdr. Stainforth

ONE of the activities of the late Wing Cdr. Stainforth, A.F.C., which was not generally known to the world, was the interest he took in poor boys in South London. He was at one time vice-president of the Ted-Mor Boys' Club, 172, Lavender Hill, Battersea.

On hearing of his death in action, the club decided to hang a memorial to him on its walls, and invited Mr. Geoffrey Smith, M.B.E., to unveil it. The ceremony took place on October 15th, Mr. Smith (who was unable to be present in person) being represented by one of the staff of *Flight*.

AIRCRAFT PROPULSION SYSTEMS

PART II—Turbine-airscrew Combinations Reviewed

By G. GEOFFREY SMITH, M.B.E.

THE first part of this article appeared in "Flight" of Oct. 15th and dealt with the demand for power units of greater output and outlined the factors limiting the further development of reciprocating engines. Combustion gas turbines driving airscrews were examined as a possible alternative and a Brown-Boveri design was described. Other projects are briefly reviewed in this concluding part of the article.

Ljungströms Propulsion Unit

ANOTHER combined airscrew and efflux propulsion unit, projected by the famous Swedish concern Aktiebolaget Ljungströms Angturbin, is shown diagrammatically in Fig. 7. The air is compressed in a multi-stage centrifugal blower, and to reduce overall length the annular mixing chamber envelopes the turbine. This feature necessitates two reversals of flow, which would seem to involve some loss of efficiency. Particular importance is attached to increasing the propulsive effort in the shortest possible time for take-off and in emergency and special arrangements are provided for this purpose.

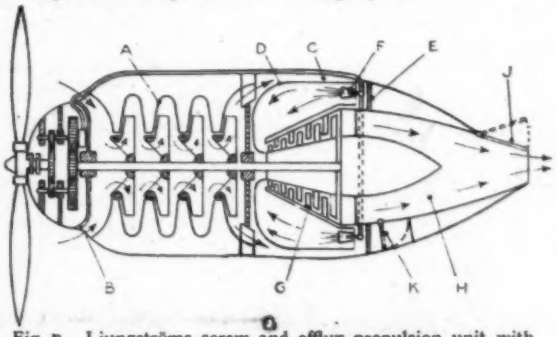


Fig. 7. Ljungströms screw and efflux propulsion unit with multi-stage centrifugal compressor.

Housed in a streamlined casing, the four-stage centrifugal compressor A draws in air through inlets B and delivers to a space C surrounding the annular mixing chamber D. At a bulkhead E the air stream is reversed and enters the mixing chamber past a plurality of shrouded fuel nozzles F. Combustion occurs in the vicinity of the nozzle shrouds and the temperature of the combustion gases is lowered by the excess air. At the forward end of the mixing chamber the flow is again reversed to enter the gas turbine G. From the annular outlet of the turbine the relatively low velocity effluent flows along a convergent duct H which raises the velocity at the discharge nozzle.

Normal regulation of aircraft speed is effected by adjustment of the supply of fuel at nozzles F. For rapid acceleration, however, a sudden and substantial increase of fuel would raise the gas temperature unduly as the compressor cannot be instantaneously accelerated to deliver a corresponding supply of air. To facilitate this speed-up, the power input to the compressor is temporarily increased by reducing the power applied for propulsion of the aircraft, either by the airscrew or the efflux reaction or both. Subsequently the proportionate division of energy between compressor and propulsion is restored to normal at the higher level, and it is claimed that this operation is considerably quicker than the method of gradually increasing the fuel supply to the desired amount.

For this purpose a flap J in the discharge duct may be raised to increase the area of the discharge orifice. Alternatively or additionally, a flap K adjacent to the turbine outlet may be lifted to by-pass a portion of the effluent. By either or both means the propulsive effort is lowered, the back pressure on the turbine is reduced, giving an increased heat and pressure drop in the turbine which thus produces more mechanical energy which is entirely absorbed by the compressor. Another method of achieving the desired results, either instead of or in addition to decreasing back pressure, is to increase the slip of the airscrew. If the airscrew blades are temporarily adjusted to a finer pitch, less energy will be absorbed for propulsion and, correspondingly, more will be available for the compressor.

Heppner Turbine Plant

In the usual construction the output torque is taken directly from a common rotor shaft and represents the difference between the torque exerted by the turbine and the torque absorbed by the compressor. An outstanding feature of the Heppner design is that the output shaft is entirely separate from the rotor shaft and power is transmitted pneumatically by the air flow from the compressor. By this means a useful stage of speed reduction between turbine rotor and output shaft can be obtained without mechanical gearing. Further, due to the absence of mechanical connection, the turbine and compressor can be more readily accelerated or decelerated and thus regulation is facilitated.

The plant shown in section in Fig. 8 is not specifically intended for an aircraft propulsion unit but serves to illustrate the constructional principle. To avoid end thrust a twin, axial flow turbine is employed, the rotor A being attached directly to the shaft of the balanced compressor impellor B. Coaxial with the impellor is a cage rotor C carrying a ring of radial-flow blades D, surrounding the impellor and being accommodated within the compressor casing. Rotor C is integral with or attached to the output shaft E and is sealed against the compressor casing by means of labyrinth packings F.

Air is admitted to both sides of the compressor impellor and delivered through the blading of the output rotor C. By suitable design the output shaft is arranged to rotate

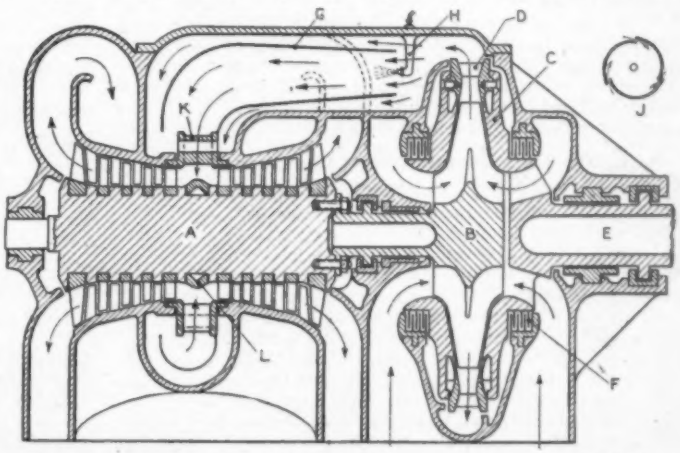


Fig. 8. Heppner turbine plant embodying pneumatic power transmission.

AIRCRAFT PROPULSION SYSTEMS (PART II)

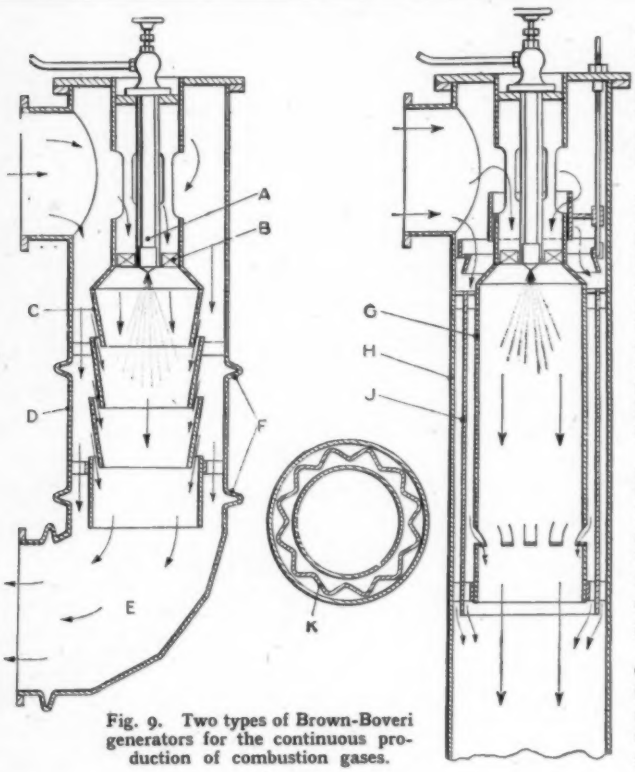


Fig. 9. Two types of Brown-Boveri generators for the continuous production of combustion gases.

at about one-third the turbine rotor speed. The torque delivered by the turbine is necessarily transmitted wholly to the compressor impellor and, as no stationary reaction members intervene, the same torque will be passed to the output rotor. In proportion to the energy required to compress the air the speed of the output rotor is reduced.

After passing the output rotor the air enters a frusto-conical combustion chamber G into which fuel is injected by nozzle H. The chamber is built up of overlapping shrouds, as shown in the detail section (J in Fig. 8) thereby furnishing longitudinal, tangentially directed air inlets. Excess air flows between the chamber and the casing and enters the chamber by way of the tangential slots to mix with the combustion gases which reach the turbine inlet at a lowered temperature.

The gases enter the turbine through a stationary ring of guide blades K, which are made hollow for cooling purposes. At the centre of the turbine rotor the gases, entering radially, are guided into opposite axial directions by a suitably shaped flange member L of a heat-resisting steel.

Separate Unit Combustion Chambers

It will have been noted that the diagrammatic sketch of the 2,000 h.p. locomotive set, Fig. 3, showed a combustion chamber which is virtually a separate unit interposed between compressor and turbine. A component of this type might well be used as a central gas generator for two wing-mounted turbine units driving airscrews. Two such generators of combustion gases, both of Brown-Boveri design, are sketched in section in Fig. 9. The one having the inner lining formed of a series of nesting conical sections is of the type actually employed on the locomotive. They are constructed of sheet metal, the requirements being an inner casing capable of withstanding without deformation a temperature of about 1,800 deg. F., and an outer shell supporting the pressure of the compressed air and combustion gases. At the present stage of development this pressure will probably be not more than 45-50 lb./sq. in. They can be mounted in any position.

Air from the compressor is delivered to the annular space around the axially disposed fuel injection nozzle A and the necessary air for combustion enters the inner casing through a ring of guide vanes B which impart a helical swirling motion to ensure intimate mixing with the atomised fuel. Usually only 20-25 per cent. of the air is required for combustion and the remainder is utilised to lower the temperature of the combustion gases to 900-1,000 deg. F. prior to admission to the turbine. At the same time it serves to conserve heat by forming a high velocity layer between inner casing C and outer shell D and avoiding losses by radiation.

Air flow is indicated in the sketch and at each peripheral slot formed by the nesting sections some of this excess air flows into the inner casing to form a boundary layer, protecting the casing from heat and eventually mixing with the gases. The main mixing to produce the prescribed driving gas is effected in the terminal space E. Corrugations F in the outer shell and inlet and outlet ducts serve to accommodate expansion and avoid the stressing of the structure.

In the second sketch, Fig. 9, is a plain cylindrical combustion unit embodying another feature further to reduce radiation loss. To avoid the transmission of heat from inner casing G to outer shell H a cylindrical screen J is inserted to divide the cooling space. The contact surface giving up heat to the cooling air is thus increased by the area of both inner and outer surfaces of screen J. Providing the cross-sectional area of the cooling space is maintained several such screens may be employed, suitably spaced concentrically to one another. Alternatively, a single screen may be longitudinally corrugated, as in the detail section K in order to increase the area of the contact surface.

As indicating the efficiency of this device, the following approximate particulars are cited for a combustion chamber 39in. in diameter supplied with air at a pressure of 44 lb. sq. in. and a temperature of 300 deg. at a velocity of 66ft. per second and burning mazut, a highly radiating, heavy residual oil. Without a screen the temperature of the inner

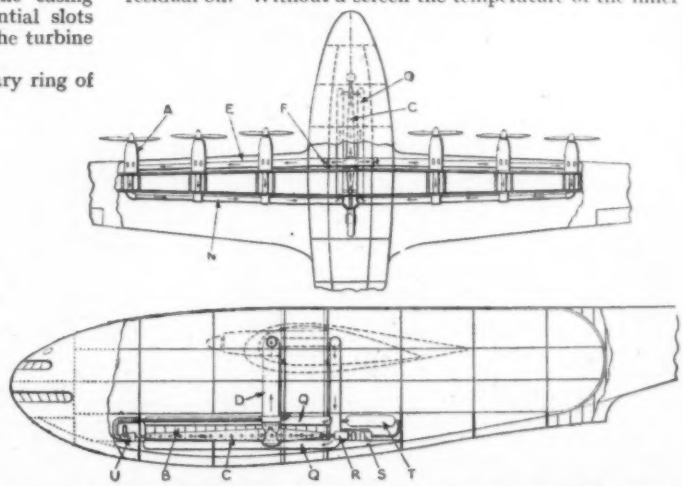


Fig. 10. Baynes-Muntz layout of a multi-screw turbine plant for a large, high-altitude transport aircraft.

casing wall was 1,976 deg. F., and the outer shell 1,380 deg. F. With a screen inserted these figures were lowered to 1,920 deg. F. and 392 deg. F. respectively, the screen assuming a temperature of 932 deg. F.

Multi-screw Plant for Large Aircraft

Constituting an interesting "peep into the future" is the multi-screw plant projected by L. E. Baynes and the Alan Muntz Co. for large transport aircraft. The general layout of the plant in a large flying boat having a pressure-sealed hull for high-altitude operation is given in plan and elevation in Fig. 10. Six wing-mounted turbine units A driving airscrews are supplied with combustion gases from a battery of generators B located in the pressure hull where they can be given attention or adjustment during flight. There is no access from the pressure hull to the interior of the wing.

The generators are arranged in two banks, one on each side of the centre line of the hull, and deliver gas to a common manifold C from which a vertical duct D carries it to the wing level. Here it passes to lateral ducts E serving port and starboard turbines. the distribution being controlled by butterfly valves F which enable speeds to be adjusted and permit directional control when taxi-ing on the water.

Details of the generators are not specified, but they may be of a stationary type resembling the Brown-Boveri units already described, or of the Pescara type, in which the driving gases consist of the combustion products from the engine cylinders of free-piston compressors. It is proposed that the generators be cooled by a liquid circulated along the leading-edge of the wing to prevent icing.

The arrangement of the turbine unit driving the airscrew is illustrated in Fig. 11. From duct E driving gases enter the annular space G and pass forward to the inlet of the turbine H, which drives the airscrew through a reduction gear J. The exhaust from the turbine H is conducted to an auxiliary turbine K driving primary and secondary stage turbo-blowers L and M. These units draw air from the nose of the casing immediately behind the airscrew,

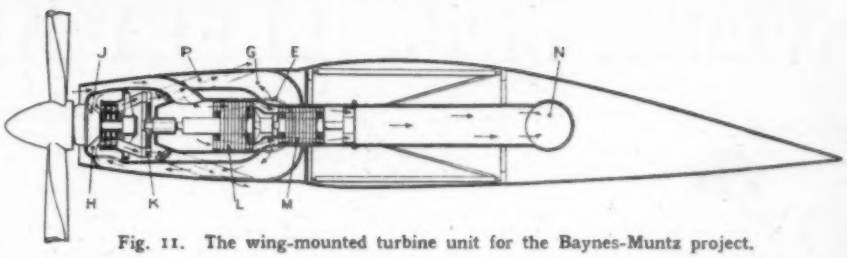


Fig. 11. The wing-mounted turbine unit for the Baynes-Muntz project.

and after compression deliver it to lateral air ducts N in the wing. Auxiliary turbine K exhausts directly to the slipstream by way of passages P. From ducts N the air is fed to pairs of manifolds Q (Fig. 10) supplying port and starboard banks of gas generators.

At the rear of the banks of gas generators is an auxiliary turbine R driving an electric generator for the ancillary services of the aircraft. One of these is an electric motor-driven air compressor S for charging a high-pressure storage bottle T from which manifolds Q are filled when the gas generators are to be started up. Forward of the gas generators another auxiliary turbine U drives a blower which maintains the requisite air pressure inside the hull when the aircraft is flying at high altitudes.

Conclusions

From these necessarily brief accounts of the difficulties confronting further increase in the power output of reciprocating engines and of the practical achievements of the combustion gas turbine in other spheres, it would appear that the turbine units may in the near future be adapted for aircraft propulsion. This article deals specifically with gas turbines driving airscrews and does not attempt to cover jet propulsion by turbine-driven compressors, which involve other considerations. It should be remembered that the turbine propulsion unit, whether airscrew or jet type, can be arranged to provide a large measure of automatic compensation for variation in barometric pressure, and is thus particularly suitable for aircraft operating at high-altitude levels. In this respect it resembles the exhaust turbo-supercharger for reciprocating engines which is, of course, a turbine-compressor unit employed for auxiliary duty.

T.C.A.'s War Role

IN Western Hemisphere defence, Canada's national air line, the T.C.A. is playing an important part. In addition to moving members of defence personnel of both Canada and the United States on urgent business, airplane parts, medical and hospital supplies, serums, repair parts for machinery, etc., needed in a hurry, are shipped by air express.

In the matter of air express, this has grown to considerable proportions, according to F. M. Smith, Superintendent, Canadian National Express at Moncton, which handles air express shipments for Trans-Canada Air Lines. Air express services are operated by the T.C.A. in the Maritimes between Moncton and Halifax, Charlottetown, Summerside, Saint John, N.B., Sydney, N.S., and Gander and St. John's, Newfoundland. Connection is made at Moncton with the transcontinental services of the Trans-Canada Air Lines, with Northeast Airlines from Boston, Mass., and with Maritime Central Airways.

In the case of the Newfoundland service, inaugurated on May 1st last, the number of packages has grown from 147 with a total weight of 2,440 lb. for the month of May to 443 totalling 8,839 lb. for the month of August, of which 55 packages totalling 1,049 lb. were on United States account. At Halifax total packages have grown from 305 with a weight of 2,256 lb. for the month of August, 1941, to 415 with a total weight of 4,762 lb. for the same month this year.

The time factor is one of the features of air express, Mr. Smith stated, as, for instance, a package leaving St John's, Newfoundland, Gander, Newfoundland, or Halifax, N.S., in the afternoon, should arrive Montreal or Boston the same evening, and New York, Winnipeg or Vancouver the following morning.

The total amount of air mail and express carried by the Trans-Canada Air Lines also showed increases in July, according to the report recently made public by O. T. Larson, vice-president. Passenger traffic declined slightly from 10,317 in June to 9,440, but the indications are that travel was heavier in August.

During July the mail load amounted to 192,971 lb., an increase over June of 18,867 lb., and 83,728 lb. better than July, 1941. The greater volume was spread fairly generally over the entire system, with a notable increase in the quantity out of New York to Toronto, which was nearly doubled in the month.

Increasing by 4,342 lb. over June, air express reached a record of 33,323 lb. The average length of passenger journeys over the T.C.A. in July was 555 miles, as compared with 525 miles in June and 504 in July 1941.

New Plywood Military Trainer

ON contract for the U.S. Army, the Ryan Aeronautical Company, pioneer of the low-wing training plane field, has completed a new plastic-bonded plywood military primary trainer of advanced design which is believed to be the nearest approach yet reached toward the almost complete elimination of strategic materials in military aircraft.

Aluminium alloys and all strategic materials have been eliminated in the new Ryan ST-4, with the exception of the engine cowling, which represents less than 2 per cent. of the total weight of the airplane. No forgings, castings, or extrusions are used, nor are critical steels used for any of the fittings or structural parts.

The ST-4 is an open cockpit two-seater powered by a 185 h.p. 6-cylinder horizontally-opposed air-cooled Lycoming engine.

WORK of the FLEET AIR ARM

Widespread Operations : Increasing Needs : Problems to be Solved

By MAJOR F. A. de V. ROBERTSON, V.D.

ONLY now and then does the work of the Fleet Air Arm get much publicity. When it torpedoes Italian battleships in the harbour of Taranto or plays a prominent part in the Battle of Matapan it gets headlines in all the papers. Analytical observers note that speed does not always allow a flying enemy to escape from slower British warships, for aircraft are faster than any ships, and their torpedoes can slow up the German *Bismarck* or the fast Italian cruisers and compel them to wait for their doom from the heavy guns of the British battleships.

At other times there are almost casual mentions that naval aircraft have worked with the R.A.F. in attacking Axis communications in Egypt or in taking toll of the supply vessels which cross from Europe to the harbours on the North African coast. In between times the Fleet Air Arm works as silently as the rest of the Navy, which is proverbially the Silent Service.

The British public ought to know that the Fleet Air Arm is always at work, though the results of that work do not always get prompt attention. The Navy is not always silent from sheer love of secrecy or because it shrinks modestly from the limelight. There are times when publication of the work of naval aircraft would give the enemy a clue to the whereabouts of a carrier, and that sort of hint must be withheld. Some idea is given in the official history of H.M.S. *Ark Royal* of the many sweeps undertaken by Admiral Somerville in the Western Mediterranean which were never reported. The Admiral said that if he went out without the *Ark Royal* he felt like a blind man without his dog.

Servicing Carriers

British aircraft carriers are ever ranging further and further across the world and, as the war spreads, they will have to go still further afield. This brings problems in its train. The carriers go further and further away from the aircraft factories and supply depots, and the main problem is how to keep the complement of machines in each carrier all serviceable. Even with the best of pilots (and naval pilots are as good as the best) bad landings will occur at times. A carrier is not so steady as an airfield on land, and there are times when it is a matter of extreme difficulty to get down safely on the flight deck. When the *Ark Royal* was out after the *Bismarck*, for instance, the rise and fall of the round-down of her flight deck was over 50ft., and even with an easy machine like the Swordfish the pilots were hard put to it to make their landings. In addition to such occasional difficult conditions there is the normal wear and tear to which all aircraft and engines are subject even in the most favourable circumstances.

Obviously a carrier is not of much use if many of her machines are not serviceable, and the Naval Air Division of the Admiralty has to arrange as best it can for spares of all sorts—from complete airframes and engines downwards—to be available at some base, in whatever ocean a particular carrier is working. Sometimes machines can be flown out to a base, but the maintenance men and the equipment needed in the hangars have to go by other means, which usually implies by ship. Sometimes, too often in fact, the machines also have to be transported by cargo vessels. Such ships move slowly, especially when in convoy, and, moreover, it would be a great advantage if they could be relieved of that work and set free for other purposes.

The most desirable alternative is air transport, and the Naval Air Division has not overlooked that possibility. One squadron of the Fleet Air Arm has been formed as a transport squadron. It does not, however, work merely to supply the needs of the carriers. It is at the service of all H.M. ships and shore stations, and it carries to bases overseas all sorts of supplies which are not too heavy or too bulky to be packed into the transport aircraft. It is a development which has been brought about by the war, for before September, 1939, one never heard mention of such an idea as the Fleet Air Arm developing a transport squadron.

The Transport Squadron

The pilots of this squadron are in a class apart from other F.A.A. pilots, for the former have to be able to fly multi-engined machines, while the pilots in the carrier-borne squadrons or the catapult flights have not been trained for such work. The transport squadron has to be prepared to fly in all sorts of weather and to find its way unerringly over jungle country. In some cases there are alternatives to air transport if the weather is altogether too unpleasant, but this squadron may have to deliver its goods to a base which is not served by road or rail.

The Naval Air Division has to deal with the problem of keeping up the supply of such special pilots. It does not require a great number, and at present it is possessed of a sufficiency of pilots and wireless operators. Recruits, however, are needed for this squadron for the future, and it is certainly not easy to see where they are to come from. The supply of ready-made cross-country pilots in the country has already been pretty well absorbed by the R.A.F. Ferry Command, Air Transport Auxiliary, and British Overseas Airways. If there are any such men not yet employed who want to serve their country in a very important capacity they should apply to:

C.W. Branch,
The Admiralty, Whitehall, London.

The age limit for such pilots is 45. When accepted, they are granted temporary rank as Lieutenant, "A," in the Royal Naval Volunteer Reserve. The idea of using women pilots is not excluded, although none has been accepted as yet. The alternative to finding new recruits already trained is to train new men for the job. The A.T.A. does this, and as it is a basic principle of our present organisation (and a very admirable one) that the R.A.F. should be responsible for all elementary flying training for all three Services, there seems on the face of it no reason why the A.T.A. should not undertake to train men as pilots for the transport squadron of the Fleet Air Arm.

In this case it would not be elementary flying training, but training on multi-engined aircraft, which the Navy is not in a position to undertake for itself. In any case, duplication of training schools is a thing to avoid wherever possible; it is far less extravagant to expand an existing school than to found a totally new one.

Naval Aircraft Squadron Equipment

Another problem which is always before the authorities of the Naval Air Division is the equipment for naval squadrons. It is sometimes said that the Fleet Air Arm is not adequately provided with up-to-date types of aircraft, and the Swordfish is often quoted as an example of this. That type has done magnificent work, for all that it now looks like a museum piece—a biplane with wheels which do not retract. One contributor to *Flight* has pointed out that the Swordfish was designed to the old T.S.R. specification (Torpedo Spotter Reconnaissance), which meant that it had to be capable of carrying out a number of different duties, and of necessity it had to be

WORK OF THE FLEET AIR ARM

a compromise. Within the limits of the specification it has fulfilled its many duties very well. The Swordfish is easy to handle and lands slowly, which is an important virtue when the carrier is in a rough sea. The Swordfish is now obsolete for a fleet action, but it is still very useful for certain other jobs, among which is searching for submarines. In fact, for some of these special tasks the Naval Air Division is of the opinion that a more suitable type of aircraft could hardly be designed.

Fighters have also given the N.A.D. much thought. They decided to adopt the Hurricane 1 about the time when the Air Ministry began to use the Hurricane 2. Hurricane 1 had to be converted into a Sea Hurricane; that is to say, it had to be fitted with a hook to engage the arrester wires when landing, and it had to be equipped for catapulting when the wind was not strong enough for a normal fly-off. These conversions were matters for the designers. From the time a type is selected for conversion to use on a carrier until it is delivered to the squadrons the whole business usually takes upwards of six months.

The selection of the Hurricane 1 by the Naval Air Division at the time when the R.A.F. was re-equipping its squadrons with Hurricane 2 seemed like a fortunate coincidence, though it would be more correct to describe it as clever dovetailing. The Air Force had on hand a supply of Hurricanes of the earlier mark, most of them entirely new, though some had actually taken part in the later stages of the Battle of Britain. They were handed over to the Navy for conversion.

The naval pilots were not too pleased at being asked to fly machines which had actually taken part in the Battle of Britain, glorious though the record of some of those machines might be. Now, however, it can be said that the equipment of the naval fighter squadrons is quite up to date. More than that it is not advisable to say.

Naval pilots, on acceptance after completing their elementary flying training, are all sent to an Advanced Flying School under Air Ministry management. Then they are split up into three classes—fighters, pilots for T.S.R. squadrons, and those for Amphibian Boat Reconnaissance flights. The fighters go to a fighter school run by the Admiralty, the T.S.R. men to a naval torpedo school, and those destined for A.B.R. work (which means flying catapult seaplanes from cruisers and capital ships) to an appropriate training school. Pools of naval pilots are maintained at home and overseas, and every pilot gets upwards of 250 hours in the air before he is posted to an operational squadron in the Fleet Air Arm.

COASTAL COMMAND ON THE SCREEN

An Excellent Addition to Service Films

AIR CHIEF MARSHAL SIR PHILIP JOUBERT and his officers and men make very good film actors, and the R.A.F. certainly knows what goes to make a good show in a cinema. *Target for To-night*, the story of Bomber Command, won universal popularity, and the latest effort, *Coastal Command*, deserves at least equal praise. Three incidents have been depicted as the highlights of the film, namely, convoy protection by a Sunderland and a Catalina, ending in a bombing attack on a U-boat; shadowing and attacking a German surface raider, the *Dusseldorf;* and the return of a damaged Sunderland, attacked by Ju 88s which are finally driven off by Beaufighters. The attack on the raider gives an opportunity to show scenes in Iceland, whence Beauforts take off to make torpedo attacks, followed by Hudsons with their bombs.

Not the least impressive scenes are those in the Operations Room of the Command, where huge maps with symbols on them give a realistic idea of the enormous scope of Coastal Command's work. One hears messages come in from the aircraft out over the Atlantic and sees the measures taken as a result. The naval liaison officer is prominent, and the C.-in-C. also speaks personally to the Admiralty to concert measures. Navy and Air Force are shown working in full harmony.

Plotters of the W.A.A.F., doing their work quietly and in a very businesslike way, provide the only feminine interest—for which one is duly grateful, for many Service films have been almost ruined by quite unnecessary love stories. Wit and humour of high quality are provided by several of the airmen, who are real airmen and not actors in uniform.

The photography is splendid, and the shots are chosen with excellent judgment, whether they show machines from outside or work inside the hull, or views down below as seen by the crews. In fact, no adverse criticism of this film is possible, and hardly any praise could be too high for it.

BOOK REVIEWS

"Thy Muse Hath Wings," by Pilot Officer G. Eades. Pen-in-Hand Publishing Co., Ltd. 3s. 6d.

THIS is a second edition, and since its publication the author has been promoted to the rank of Flying Officer. The first edition was reviewed in these columns on December 11th last, and the present one is a revision with additional verses of equal appeal.

"Britain's Air Power," by R. A. Saville-Sneath. J. Salmon, Ltd. 3s. 6d.

WITH an attractive cover design in colours, showing Spitfires in a power dive, by Roland Davies, this slim 24-page publication tells the story of the development and rising strength of the R.A.F. and Fleet Air Arm from September, 1939, onwards. It deals with its subject from the operational viewpoint and pays chief attention to the aircraft rather than to the purely historical aspect, although brief references to some of the more outstanding events, such as the Battle of Britain, Dunkirk and Matapan and Taranto are made in connection with the particular aircraft involved.

Every page is illustrated, mostly by very attractive coloured reproductions of water colour drawings by A. F. D. Bannister, of aircraft in action, and to a lesser extent by photographs of different types taken in the air, in every case accompanied by a brief specification including performance figures where available. American types in service with British air forces are also included.

"Weather: An Introductory Meteorology for Airmen," by W. G. Kendrew. Oxford University Press. 2s.

ALTHOUGH modestly described as of an elementary nature, this book goes pretty thoroughly into the subject of weather, with particular reference to its interest for, and effects upon, the airman. It runs to 96 pages, is copiously illustrated and includes an alphabetical index for easy and quick reference.

"Aeroplanes and How They Fly." Adapted by permission from the book "Why Aeroplanes Fly," by Arthur Elton and Robert Fairthorne. Longmans. 1s.

THIS little volume will appeal more to the very young sons of FLIGHT readers rather than to our readers themselves; it is written in language of quite childish simplicity and devotes most of its 40-odd pages to describing why a kite flies, but finally gives a brief and very elementary account of how an aircraft is made to "do what you want it to do."

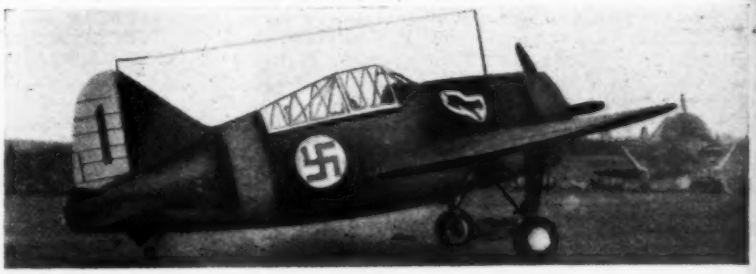
BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Duce's Friend

ITALIAN sources report that Vincenzo Coppola, Chairman of the L.A.T.I. (Italian Transcontinental Air Lines Company), which operated between Italy and South America, has been arrested by the Brazilian police authorities.

Signor Coppola, who while in Brazil indulged apparently in other activities apart from his business, is stated to be a personal friend of the Duce. Incidentally, the equipment of the L.A.T.I. has been confiscated by the Brazilian Government and is being made good use of by our new Ally.



SWASTICATED YANK: A Brewster "Buffalo" supplied before the war, is now in service with the Finnish Air Force on the Russian front.

Italian Fuel

BY order of the Duce, a new office has been created in the Italian High Command. The new "General Office for liquid fuels, lubricants, etc.," is to take charge of the entire production and distribution of these materials.

In January, 1941, a central office for the control of motor fuel and lubricants was established, but apparently the military authorities were not entirely satisfied with the measures taken by that civilian institution and have now assumed direct control.

All departments of the Government dealing with fuel problems are now subordinated to the military "General Office." The existing control machinery will be thus preserved, but the policy of motor and aviation fuel preservation will rest entirely with the military.

From Germany

WITH a capital of about 500,000 German marks, a new company was registered this month in Berlin. This "Henschel Concern, Ltd.," is to secure a uniform direction and control of the different firms associated with the Henschel. The Henschel family still retains a strong interest in the affairs of the firm, and Oskar R. Henschel, of Kassel, is the managing director of the new controlling organisation.

A hitherto not very well-known aircraft firm, the *AGO Flugzeugwerke*, of Oschersleben, is being substantially enlarged. The firm, which has until now been mainly engaged on sub-contract work, is now to go over to the construction of aircraft. Incidentally, the AGO is controlled by the largest German electrical combine, the A.E.G.

[Actually, the A.E.G. took over the AGO firm in the last war.—ED.]

Reports from Germany also indicate that the Junkers factory in Dessau is undergoing substantial alterations. It is possible that the building activity there is connected with the construction of bomb-proof plants.

Emergency outfit carried by German aircraft. (Top) a wrist compass, mineral water, a metal container, in which matches, cigarettes, biscuits and chocolate are kept. (Centre) a Very pistol with ammunition, an oxygen mask for high altitude flying and a box with concentrated food. A tent is also part of the equipment.

Skill for Italy

AT a recent meeting of the Fascist National Institute for Training of Industrial Workers, the problem of skilled labour for the aircraft industry was widely discussed. To ensure better reserves of skill for this industry as well as for other engineering trades, the Italian Government is to organise a greater number of training courses for young workers.

It is expected that these courses and a better co-operation with the different youth organisations will provide the Italian aircraft industry with a better supply of skilled labour than it has at present.

More Rubber

GERMAN efforts to increase their supplies of synthetic rubber are not limited to Greater Germany but also extend to their "allies." In co-operation with the Rumanian Government a new company has been formed for the manufacture of synthetic rubber. The new firm, called the "Rumaenische A.G. zur Erzeugung von Romacol," is sponsored by German chemical interests and is to build two plants for the production of a type of synthetic rubber. The product of the company was given the patriotic name of "Romacol."

Jap Invention

DESPITE their Malayan conquests, the Japs seem to be suffering from a shortage of fuel for their mechanised and air forces. Probably the destruction of oil wells and refineries in the areas occupied by Japan has been thoroughly carried out, for it is now reported from Tokio that researches are being made to find new sources of fuel.

Early this month a report from Kuala Lumpur stated that a new process was discovered to produce petrol and other fuel oils from rubber. The process, which is based on distillation, is also to produce diesel oil, lubricants and medium oils as by-products.

It is asserted that the method developed is capable of large-scale production and a plant is to be erected at Malacca. The capacity of the plant is stated to be estimated as being capable of a production of 30,000 gallons of petrol per month.

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Nineteenth of the New Recognition Series

AIRCRAFT TYPES AND E

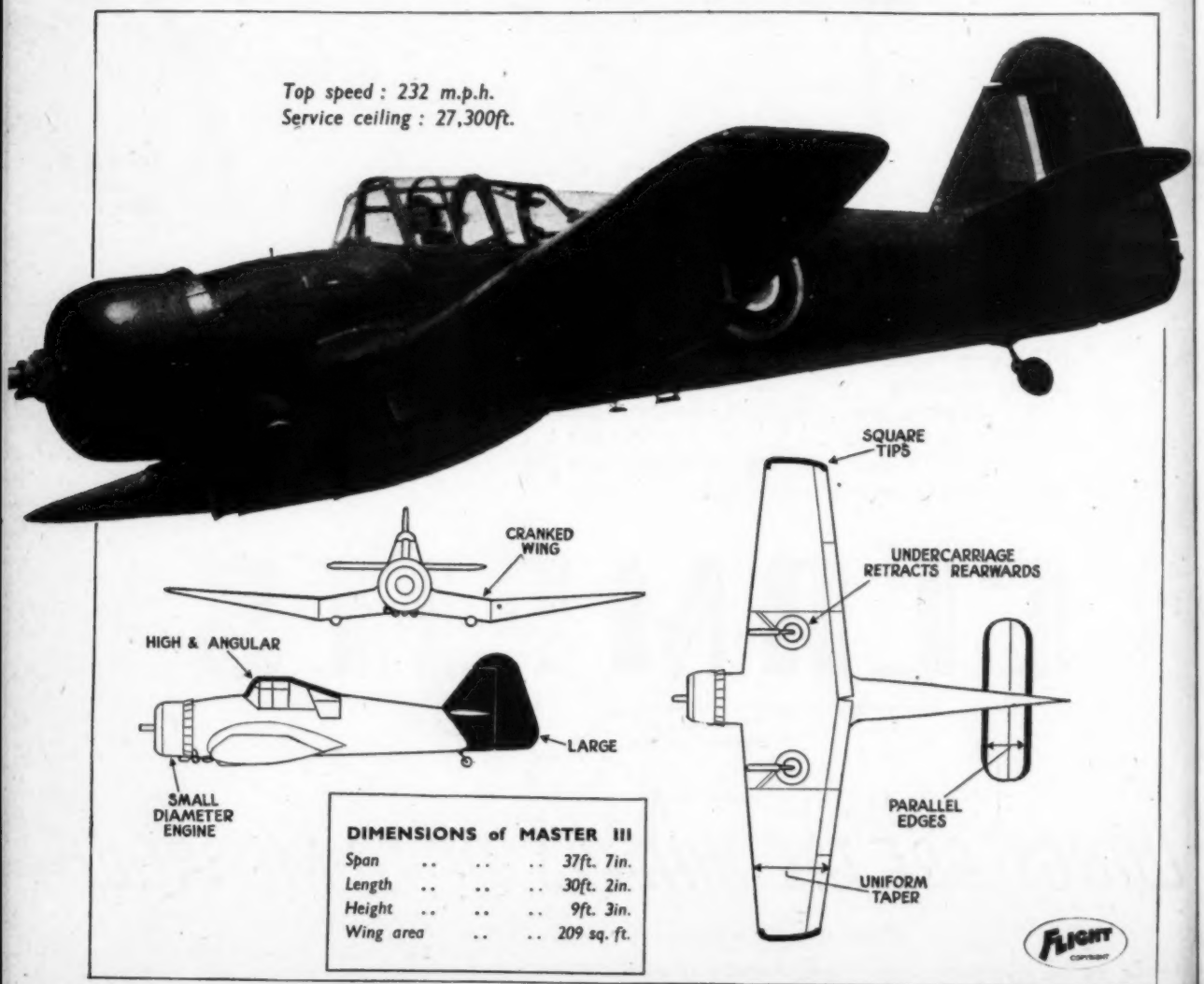
MILES MASTER III

THE only material differences between the Masters I, II and III of the celebrated Miles family is that of the engine fitted. All Miles Masters have the same wooden fuselage and wing structure with plywood skins, and a recent modification (which is of prime importance to the spotter) is that the wing tips have been clipped. It will be remembered that the wing tips of the Master were rounded, but they are now square, and the span has been reduced by a total of 3ft. 5in. Incidentally, this not only applies to those now being produced; all Masters in service are being modified in the same way.

The object of the alteration is to reduce the flying stresses and so raise the safety factor which, in practice, was found to be a bit below the theoretical one. It has also raised the stalling speed slightly but manœuvrability has been somewhat improved, while top speed is said not to have been noticeably affected. Ceiling and rate of climb, in fact, are the only aspects of performance which have suffered slightly by the change.

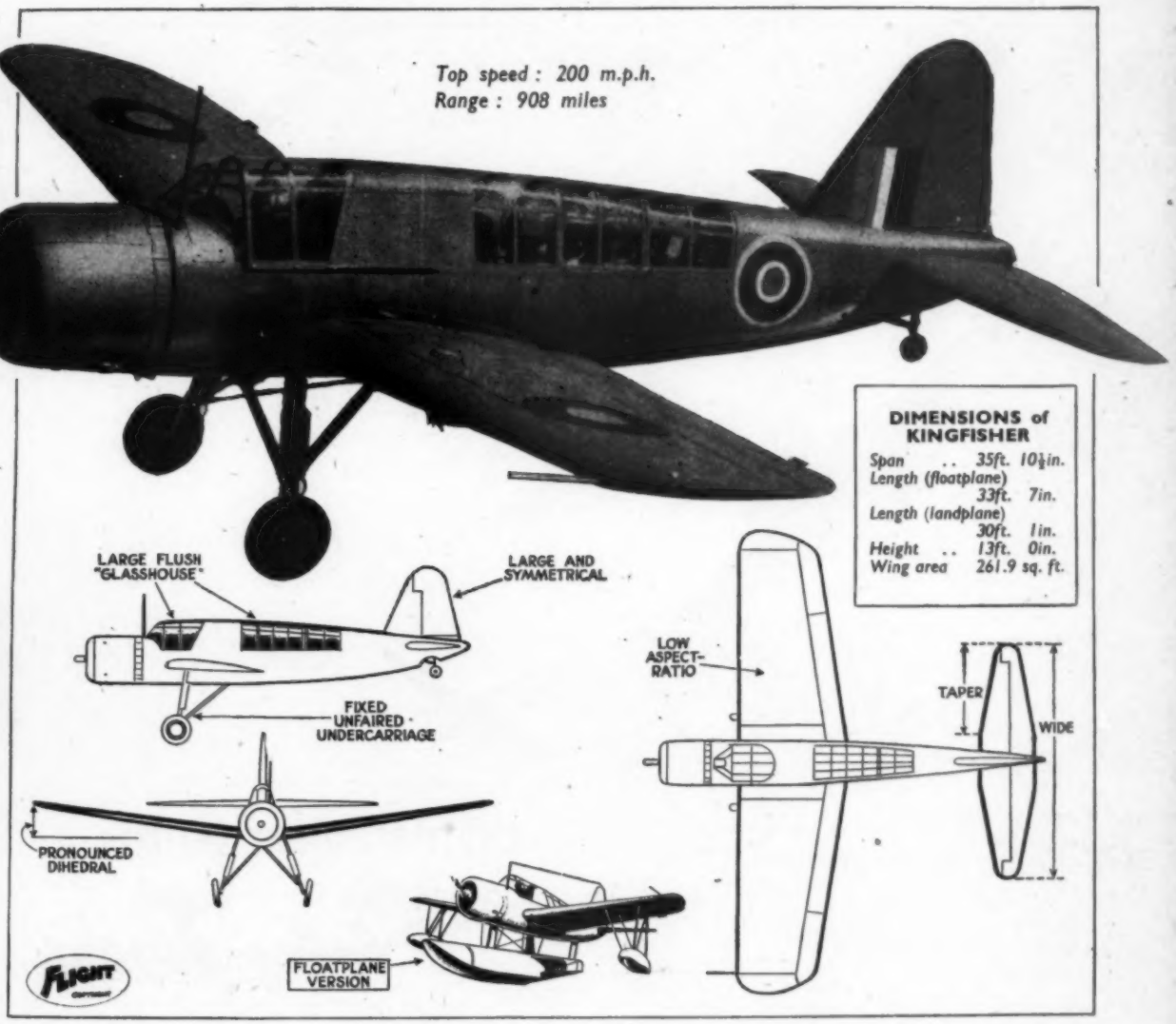
Ever since the successful introduction of the Master I, with the Rolls-Royce Kestrel engine, Miles Masters have been the standard advanced trainer for the R.A.F., and, to the potential fighter pilot, the immediate prelude to the handling of operational service types, such as the Hurricane and Spitfire. The Master II, with Bristol Mercury XX engine of 870 h.p. was faster than the latest Master III, with its Pratt and Whitney Twin Wasp Junior engine of 825 h.p., but since the latter has a 14-cylinder radial power unit instead of the previous 9-cylinder radial engine, it is much smoother, and, therefore, more pleasant to fly. Its top speed, however, is 232 m.p.h. at 7,500ft., as compared with 260 m.p.h. at 5,000ft. for the Mercury-engined Master II. At a cruising speed of 185 m.p.h., the range of the Master III is 320 miles and its service ceiling 27,300ft.

Chief recognition points for the spotter are the cranked wing (characteristic of all Masters) and the smaller cowling of the Wasp engine as compared with that of the Mercury. One machine-gun is installed in the wing to facilitate firing instruction, and the flying instructor can raise his rear seat when he wants to keep a particularly alert eye on his pupil, say, during landings.



EIR CHARACTERISTICS

VOUGHT-SIKORSKY KINGFISHER



THE Vought-Sikorsky Kingfisher, of which there is a landplane and a single-float seaplane version, was first delivered to Great Britain last year, having been ordered from America in September, 1939. Its chief function is that of general-purpose two-seater Navy observation and reconnaissance aircraft, the floatplane version being designed for catapulting, and the landplane for operation from aircraft carriers.

The U.S. Navy Kingfisher I is known as the OS2U-1, and is fitted with a Pratt and Whitney nine-cylinder Wasp Junior SB-2 radial engine, while the Fleet Air Arm Kingfisher is the OS2U-3, and is powered by the Wasp Junior R-985 radial engine giving 450 h.p. for take-off at 5,000ft. The export version of the OS2U-1 for other Allies is known as the VS-310, but this and the American and British versions of the Kingfisher are the same as regards general layout and dimensions.

It has an all-metal monocoque fuselage of riveted and spot-welded construction. The panels of the metal skin are reinforced by spot-welded stiffeners, and are riveted to two upper longerons and one keel member.

The centre section of the cantilever mid-wing is integral with the fuselage, the outer panels tapering on the trailing-edge only. They are of the single-spar type having a "D"-shaped metal leading-edge for resisting torsional stresses. The tailplane is unusual in plan, in that it has a rectangular centre-section from which it tapers sharply on both edges to small round tips, and, in some contrast to the wings, is of high aspect-ratio. The wing aft of the main spar, and all control surfaces, are fabric-covered. A fixed undercarriage of the split type is employed on the land version, the oleo legs (each of which forms one member of a tripod) being of streamlined shape, though no fairing is provided for the wheels.

In the seaplane version, the single float is mounted on two tandem struts, with wire cross-bracing to the fuselage "keel," and fixed wing-tip stabilising floats are employed. Top speeds are 200 m.p.h. and 190 m.p.h. for land and sea types respectively at 6,500ft.

An unofficial report suggests that newer versions of the Kingfisher now on order may have a diesel type radial engine in place of the Wasp Junior.

WESTERN UNION

BUFFALO NEWYORK.

COL. CLAIRE L. CHENNAULT=
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SECOND PRINTING: Send 10¢ for your copy of this fascinating 96-page history of aviation by Assa Jordanoff, author of

BATTLE-AREA AIR ORGANISATION

Two Exclusive Accounts of How Targets Close to the Front Line are Attacked and Defended

THE following articles—one from Russia and one from Egypt—are complementary in that the Russian article deals with defence, and the account from the Eighth Army with their method of attacking supply lines, fuel dumps and other close-support targets.

"Protection of Communications," by Col. A. A. Parvov, was sent by radio to Flight from Moscow and deals with a problem which has been given much thought in this country. It is, in effect, the main Battle of Britain problem of how to intercept enemy bombers —which are over your territory for a very short space of time—before they reach their target. As Col. Parvov points out, standing patrols are wasteful of men, machines and fuel.

The Russians have found, as we found, that an efficient system of spotting and communication with fighter squadrons standing by at the "ready" was more effective. He does not say what system of spotting is used. Whether radio location, sound location, visual spotting or a combination of these three is employed is not disclosed, but whatever system is used appears to be effective.

The story from Egypt is told mainly by the series of pictures, which show, in stages, the channels by which air support is asked for and given. In this case speed is of considerable importance but the urgency is rarely so desperate as in the case of intercepting fighters.

PROTECTION OF COMMUNICATIONS

By COLONEL A. A. PARVOV, Soviet Air Force

DURING the past few months the Soviet Air Force has been obliged to revise its tactics of protecting communications from the air. This protection was carried out during the first period of the war by means of air patrols, but experience has shown that this is not the only possible, and certainly not the most effective, method of such operations.

Constant patrolling involves great expenditure of fuel, and is very strenuous for the airmen, particularly in the long summer days.

It is for this reason that, in the course of the past few months, the Soviet Air Force has given up constant patrolling and gone over to a system of ground duty with pilots ready to take-off at a moment's notice. This system is necessarily based on accurate information and quick action on the part of the Air Force personnel.

The speed of the take-off naturally plays a decisive rôle in this ground duty system. In the beginning, it took a considerable amount of time for the airmen to take-off, but later on it was found possible to lower it considerably. This was mainly achieved by a well-organised network of observation points based on the smoothly functioning system of wireless communication.

The duty officer at an Air Force unit headquarters has a dynamic loud-speaker sending out from an observers' post signals of enemy approach. He has before him a transmitting wireless set for directing aircraft. Upon receiving a message about enemy aircraft the officer on duty studies the situation and sends his orders from his headquarters directly to the Air Force units on duty. Having given his orders the duty officer can receive messages from the operating aircraft and correct their work.

The actual operation works out in the following manner: A wireless message is received at detachment headquarters that enemy aircraft have been sighted heading for a certain objective. The messages are received and sent out by the duty officer, but the Commanding Officer listens in. The Commanding Officer then does not waste time in instructing the leader. He comes out of his dugout and fires a signal rocket. At this instant engines are switched on and the aircraft take-off immediately. Operation orders are transmitted to the pilots by wireless. After one group of aircraft on duty has gone, another detachment takes its place according to certain schedule, and the remaining groups are made ready for action.

Take-off Orders

Although orders for the take-off are given from unit headquarters, the detachment commander is constantly kept informed by wireless of the situation, and when the threat to the objective increases he is entitled to send out orders for take off without waiting for instructions from unit headquarters.

Pilots of airborne aircraft are in constant communication with headquarters of their detachments. There have been occasions when as many as three formations of aircraft from different detachments were directed by wireless.

Often in repulsing bomber attacks on protected objectives we order aircraft of two different detachments to go up. In such cases the success of operation depends in considerable measure upon the co-ordination of fighters starting from two different landing fields. There have been, unfortunately, occasions in the past when aircraft of two different detachments met in the air above the objective and the degree of co-ordination between them was not sufficient. The reason for this must be sought in a somewhat faulty working of the communication system.

A line of Russian MIG3 fighters waiting to take off.

BATTLE-AREA AIR ORGANISATION

A Dornier which played once too often in the Rzhev area and was intercepted.

The tactics now in force are the following:—All communications protected by us are divided into sectors and assigned to different detachments. An instance from practical operation may serve as the best illustration. Fascist bombers have appeared over a sector protected by Commander Matveev's detachments. His pilots on duty are the first to take-off. Having considered the situation on the basis of information received concerning enemy strength, the unit Commander gives a signal for fighters of Sokols detachment to be brought up. This new flight having arrived on the spot is placed under Commander Matveev's orders. Over the wireless he then directs all aircraft operating in his sector.

What are the enemy tactics in attacks on our communications?

Since the enemy varies his tactics constantly it is necessary for us to watch them and follow these variations closely from day to day. The Germans have recently begun to attack our objectives in groups numbering upwards of ten aircraft, divided into formations of three or more machines. As a rule enemy bombers are escorted by two or four pairs of fighters flying 1,800 to 2,400ft. above the bombers. Usually, enemy fighters arrive on the spot either before the bombers or with one of the first flights. Striving to remain unnoticed the fighters come in pairs with the sun at their backs. They usually join battle only after the bombers under their protection have been attacked.

The Germans use all sorts of ruses in the hope of tricking the Soviet Air Force. In laying out their course

Russian fighter pilots on the Karelian front. In the background is one of their Kittyhawks.

One of the square-horned sound-locators used by the Russian spotters.

towards their objective German bombers often attempt to mislead Soviet fighters. Once a message was received at headquarters that four groups of bombers flying along different courses had been sighted 30 to 40 kilometres from the airdrome. A close study of these courses made it apparent, however, that all these aircraft were heading for one and the same objective. The officer on duty gave orders for aircraft to take-off. Soviet fighters intercepted the first group of the German bombers near the objective and attacked. The remaining groups of the bombers made their appearance in intervals of two to three minutes, and they were all met by Soviet fighters in time.

Soviet fighter tactics which have withstood severe tests during the last six months consist of offensive operations in formation. The most usual formation is six to eight aircraft flying in pairs. Closed-circle formation is no longer used, since it makes active offensive operations impossible.

The Soviet fighters usually try—as a rule successfully—to intercept the enemy ten to 15 kilometres from the objective which is to be protected; another flight of patrolling fighters remains over the objective itself.

Tactics of fighters which prevented a big enemy raid on an important objective are typical in this respect. While the detachments of Commanders Matveev and Pavlov broke the enemy formation, other fighters shot down individual enemy aircraft by intercepting and pursuing them as far as the front line.

ARMY AIR SUPPORT IN WESTERN DESERT

IN the desert the Army and Air Force fight as one. They cannot do otherwise, for ground and air tactics in modern warfare are inseparable. Air support to the Army in the desert has now reached peak proportions, exceeding the support given by the *Luftwaffe* to the German Armies in the Battle of France. How is it done? These pictures give an idea of our system of Army-Air co-operation. They show what happens from the moment when the man on the ground sights a suitable target until the moment when our aircraft roar across to drop their bombs on it. They show the process which gets to work when the Army "whistles up its air."

The Air Forces in the Western Desert are at the disposal of the Army. The Army Commander, at the joint headquarters, tells the Air Commander what he would like the Air Forces to do. The Air Commander tells him

(Top left) An artillery officer in a forward O.P. spots a suitable bombing target and telephones back to his unit headquarters. (Top right) The call for air support is radioed to the joint Army-Air H.Q. (Bottom right) At Army-Air H.Q. the message is received by an officer of the Air Support Unit. (Bottom left) The Air Support Control Officer plots the position on his ever-changing map of the battle area.

BATTLE-AREA AIR ORGANISATION

(Top left) In the operations room the Wing Commander in charge of operations gives the order for attack. An Intelligence Officer telephones briefing material. (Top right) At a bomber station air crews gather round the briefing tent while their 'chutes and flying kit lie ready. On the airfield their Bostons are already refuelled and bombed-up. (Bottom left) At a fighter station a Squadron Leader outlines in the sand the tactics to be employed by the fighter escort. (Bottom right) The first flight of Bostons take off from the desert landing ground to join the fighter escort waiting overhead.

whether they can do it, and gives the necessary order. Such is the system in general. In detail it depends on an Air Support Control Unit in touch, through a network of wireless channels, with the forward ground units. All notifications of suitable targets in the battle area and all calls for air support pass through this unit. Here they are sifted and passed to the Air Staff, which decides whether or not to attack.

Various points must be considered in deciding whether a target is suitable for air attack. Is it far enough from our own troops for safety? Is it well defended by A.A.? Is it well or badly dispersed? Can it be easily picked up from the air? The best targets for bombers are the enemy's thin-skinned vehicles—his supply echelons, petrol convoys, troop-carriers. The hardest to damage are his guns and tanks and armoured vehicles. A good target for artillery will not necessarily be a good target for bombing.

The man on the ground has had to become air-conscious, to learn what the Air Force can and cannot do. The man in the air has had to become ground-conscious, to learn what the Army does and does not want. Each now knows the other's functions so well that there is no wastage of air effort. The weight of Air Force bombardment is used to its maximum effect.

The vital factor in air support is speed. Air attack, to be effective, must be swift. This depends first on rapid transmission of information. A call for support must be flashed back to Army-Air headquarters, by field telephone and wireless link, with the minimum delay. There a quick appreciation of the position must be made, a quick decision reached.

Simultaneously, the call has reached the headquarters of the bombers, who will make the attack, and of the fighters, who will escort them. The gong calls crews to the briefing tent. They are given details of the target, and of the best method of approach and attack. Their

(Continued at foot of next page.)

B.O.A. IN PORTUGAL

Official Opening of New Lisbon Premises

FOR about two years now—since shortly after the London-Lisbon air line got really started—B.O.A. in Lisbon have been accommodated in provisional offices ceded to them by a well-known and old-established British firm, the Royal Mail agents.

But Mr. L. E. Hough, the genial and very popular Superintendent (Middle East readers will need no introduction to him), realised that a big concern like B.O.A. must have its own offices. Indeed, the ever-growing volume of traffic made it absolutely necessary. So a convenient establishment was selected, negotiations started and carried through to a successful conclusion, and on September 29th the official opening ceremony was performed by H.E. the British Minister to Portugal, Mr. John Balfour.

It was more than a mere ceremony: it was a very highly successful party, attended by the U.S. Minister in Lisbon, the Netherlands Chargé d'Affaires, and many other distinguished visitors of various nationalities.

In introducing the British Minister, Mr. Hough gave a brief outline of the ups and downs of the Corporation since the war caused such an upset in their arrangements; the coping with all the many difficulties which cropped up; and the hard work which has had to be put in to keep the service running properly.

Official opening of British Overseas Airways' new premises in the Avenida da Liberdade, Lisbon.

Thanks to Portugal

He paid tribute to the helpful and understanding attitude of the Portuguese authorities, whose friendliness had done such a lot to make things easier. He referred to the new Air Port of Lisbon, probably one of the best on the Continent, which, when it comes into operation (as is expected very shortly), will do much to make Lisbon the Western Air Terminus of Europe, with all the advantages that will accrue to international relations, particularly between the Old and New Worlds.

He was followed by H.E. the British Minister, Mr. John Balfour, who said:—

"The opening of new business premises usually seems like a kind of christening ceremony, but to-day I have rather the feeling that we are at a coming-of-age party. The B.O.A.C. is no new enterprise; it has been with us now for over two years and has become such a part of our lives that we may easily take it for granted without pausing to think how different things might have been without it. But for the B.O.A.C. services our only physical contact with home would be by the long sea voyage.

"As it is, Britain is now some seven hours away, and we possess a regular service of flying-boats and land-planes which operate in all sorts of weather and with almost clockwork regularity. We in Lisbon have every reason to be grateful to the gallant British and Dutch pilots and their crews who have provided us with this invaluable link to supplement the sea route which our magnificent merchant seamen have kept open.

"In declaring these new premises open, may I also remind you that all this could never have been achieved without the good will of the Portuguese authorities. Thanks to their bold and far-sighted vision, Lisbon has been endowed with modern airport facilities and is in process of becoming a world centre for commercial aviation. I have no doubt that the foundations which have been well and truly laid will rapidly expand when peace restores the means of unrestricted air travel."

Mr. Hough has the knack of making friends; this was quite evident, because apart from the usual and conventional expressions of good will inseparable from such occasions, it was easy to see that all-British, American, Dutch and Portuguese—were quite sincerely desirous that B.O.A. should keep going even better than hitherto. With Mr. Hough at the helm (or should one say controls) there can be no doubt that B.O.A. will go from good to better.

At last Britain's great air line has its own premises, in the Avenida da Liberdade, 23-27, Lisbon—the main artery of the city, about twelve or fifteen minutes by car from the new airport. Not far away are the offices of the Spanish Trafico Aereo, while farther away down the Avenida are the offices of Ala Littoria.

BATTLE-AREA AIR ORGANISATION

(Concluded from page 448)

aircraft are already loaded with petrol and bombs. They start them up, ready to take-off as soon as the final word comes from headquarters.

Meanwhile the ground unit is warned to expect the attack, to put out the necessary signals differentiating our own forces from the enemy's. Half an hour later the Bostons roar over the heads of our troops towards the target. A few minutes later the heavy thud of their bombs shakes the desert. Another blow has been struck against the Axis.

The consistency of our close-support raids, both in timing and in numbers, has made a deep impression on the enemy. German prisoners tell of the legend which has grown up in the *Panzerarmee* around the formations of 18 Bostons which bombed them so regularly and so regardless of opposition in the recent battle. They call them "The 18 Imperturbables."

W.A.A.F.'s BRIGHTER NIGHTS

JUST in case they do not have enough to do in helping to beat the enemy this winter, here are some of the things which the W.A.A.F. personnel at one of Fighter Command's forward stations have planned for their off-duty hours.

Brains Trust sessions, quizzes (in which questions are put to two competing teams), debates, play readings and classes in languages, beauty culture, drawing and accordion playing.

In addition, the station has just started a W.A.A.F. orchestra and a bugle-and-drum band, which, it is hoped, will shortly appear at church parades and other ceremonies. All the personnel for these are clerks, cooks, and girls with other definite jobs on the station. They practise in their spare time.

No outside talent is being brought in. The teachers for the various classes are women who happen to have special knowledge of the various subjects.

IN PARLIAMENT

Faulty Runways : No Change in A.T.C. Grants System : New Methods Against Raiders : Loss of the "Clare" : Charge of Unfair Privilege : Security Problem

Airfield Construction

Captain York asked the Secretary of State for Air whether he is now in a position to make a further statement regarding the faulty construction of the runways of airfields, the names of which he has been given?

The Secretary of State for Air (*Sir Archibald Sinclair*): In the case of one of the two aerodromes in question I am satisfied that there was no fault of construction. In the other case, although there is no suggestion of major negligence on the part of the contractor, he has agreed to replace certain bays where there was reason to complain of the quality and finish of the work, but not where the deterioration of the surface was due to frost.

Captain York: Was the decision to continue the work during inclement weather that of the Air Ministry or of the contractor?

Sir A. Sinclair: The decision to continue in spite of the weather was due to operational requirements.

A.T.C. Grants

Mr. I. Thomas asked the Secretary of State for Air whether he is aware that the present system of financing squadrons of the Air Training Corps by means of capitation grants leaves many squadrons unable to meet their headquarter expenses and compels them to rely on public charity; and whether he will revise the system in such a way that all headquarter expenses are borne centrally?

Sir A. Sinclair: With regard to the first part of the question, I would refer my hon. Friend to the reply given to the hon. Member for Houghton-le-Spring (Mr. W. Joseph Stewart) on 28th April, of which I am sending my hon. Friend a copy. As for the second part, experience has shown that the present system of capitation grants administered locally has worked well. It was adopted after full consideration of the alternative of direct reimbursement of expenses, and I do not consider that there would be any advantage in changing it.

Mr. Thomas: Is my right hon. Friend aware that this system leads squadrons to concentrate upon scholastic examination, which is not necessarily the best test of efficiency? Would he consider basing the *per capita* grant on a 75 per cent. attendance at classes and parades?

Sir A. Sinclair: I fully realise that there is a case for a change, but this case has been most carefully considered, and we have decided to stick to the present system.

Enemy Daylight Raids

Sir Leonard Lyle asked the Secretary of State for Air whether he will consider adopting the procedure of catapulting fighter aeroplanes from a few specially selected points in the South-East, South and South-Western areas to do something to check the growing number of tip-and-run daylight raids by enemy aircraft?

Sir A. Sinclair: I can assure the hon. Member that new methods of countering enemy air attacks of all kinds are being constantly studied. It would not be in the public interest to say more.

Sir L. Lyle: While I appreciate that there are many more calls on Fighter Command, does not my right hon. Friend think that much more energetic measures should be taken to deal with these daily raids, which are causing, in the aggregate, many casualties and a certain amount of distress?

Sir A. Sinclair: No, Sir. I cannot help wondering whether my hon. Friend knows how energetic the measures are that we are taking at the present time.

Sir H. Williams: Why do they always blow the siren after I have heard the bombs drop when I am on the South coast?

Flying-boat *Clare*

Mr. Simmonds asked the Secretary of State for Air whether he can make a statement with regard to the loss of the flying-boat *Clare*.

Sir A. Sinclair: The flying-boat *Clare*, belonging to and operated by the British Overseas Airways Corporation, was, unfortunately, lost from causes other than enemy action while on passage from West Africa to the United Kingdom with all on board numbering thirteen passengers and six crew. An investigation is being held into the causes of the accident, and as soon as a report is available I will consider whether a further statement can be made. I am sure the House would wish to express its sympathy with the relatives of those who have lost their lives.

Mr. Simmonds: Would my right hon. Friend bear in mind that a number of the aircraft of British Overseas Airways are much over age, and would he, therefore, see whether some action can be taken to increase the number of modern aircraft available to the Corporation?

Sir A. Sinclair: I can assure my hon. Friend that this point has been for some time very much in my mind, and that such action as he has in mind has already been taken.

Special Trains for Air Travellers

Mr. Keeling asked the Parliamentary Secretary to the Ministry of War Transport whether he is aware of the waste of coal and man-power in running special trains to and from airports for British Airways passengers who could be carried in the ordinary trains; and whether he will ask the railway executive not to authorise such trains as long as special trains for holidays are refused?

Mr. Noel-Baker: I cannot accept my hon. Friend's suggestion that the running of these trains involves a waste of coal. They were authorised because the traffic could not economically or conveniently be carried by the ordinary trains. Apart from that consideration, my hon. Friend will, I am sure, recognise the urgent importance of making the overseas air services as rapid and as reliable as possible. They are not used for pleasure or recreation, and the running of special trains in connection with these overseas services cannot properly be compared with holiday services.

Mr. Keeling: Does the hon. Gentleman realise that when people see these special trains running—on one day last month there were fewer than 15 passengers—they find it very difficult to believe that the Government are in earnest in their appeal for coal economy? Will he look again into a matter which constitutes a scandalous case of unfair privilege?

Mr. Noel-Baker: With great respect, I cannot accept the suggestion that this is unfair privilege. I have looked into it very carefully. Nearly every day the addition of the air service coaches to an ordinary train would mean double heading the ordinary train, with a loss of engine power and engines which could be used for heavy freight traffic. This service is only for people engaged on urgent Government work, and if they missed their plane it would be very much against the national interest.

Mr. Keeling: That is not true.

Mr. Shinwell: But are we to ask miners to provide coal so that these people can have special privileges?

Mr. Noel-Baker: I have explained that in our view this does not involve a waste of coal. It is, possibly, a coal economy.

Mr. Shinwell: Why?

Mr. Noel-Baker: Because light passenger engines, instead of heavy passenger engines, are used.

Civilian Residents on Airdromes

Mr. John Dugdale asked the Secretary of State for Air whether alternative accommodation has now been found for the civilians living on the airdrome of which he has been informed; and whether there are any operational airdromes on which civilians are still allowed to live?

Sir A. Sinclair: Alternative accommodation for the civilians referred to in the first part of the Question has not yet been found. The answer to the second part is that a number of civilians are employed in various capacities on operational airdromes. In addition, it does occasionally happen that alternative accommodation cannot be found for civilians whose houses have been included within the boundaries of an airdrome, and that they have to be left temporarily in residence.

Mr. Dugdale: Is the right hon. Gentleman aware that in this case, and possibly in others, the civilians are able to get out at night when the airdrome is closed, and that they go into the public houses in the village and explain that the airdrome is closed at night for operational reasons? Does he think that this is satisfactory?

Sir A. Sinclair: I was not aware of that fact until my hon. Friend informed me of it. The position is that the movements of these civilians, as they live in a protected area, are, of course, under the control of the officer commanding the station. Now that my hon. friend has brought these facts to my notice, I am having inquiries made.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FAULTY ARITHMETIC

Power and Wing Loading of the Do 217E2

YOUR very interesting review and large detailed drawing of the DO 217E2 must have been enjoyed by many readers as well as myself. Such features are of great instructive value. As to your observations upon wing loading and power loading I cannot agree with the figures you quote. If the engines give 1,600 h.p. each, as I am creditably informed that the B.M.W. 801 actually does, the power loading for a total weight of 33,500lb. is less than 10½ lb./h.p., which is in itself high.

In this connection I saw it stated some months ago that the Ju 88 employed rocket-assisted take off. Is there any evidence that the Dornier is helped in this way?

Secondly, if the gross weight quoted is correct and the wing area of 610 sq. ft. correct, I make the wing loading figure just under 55 lb./sq. ft. which, though high, would not be abnormal and certainly less than your quoted figure of 59.4 lb./sq. ft.

Finally do you think it possible that the large fuel jettisoning pipe (so called) to the rear was devised for possible use in spreading gas? Ex. R.F.C.

[We plead guilty in the case of the wing loading figure. The editorial slide rule did give us 54.9 lb./sq. ft., and by some slip we wrote it down as 59.4.—ED.]

THE TORPEDO BOMBER

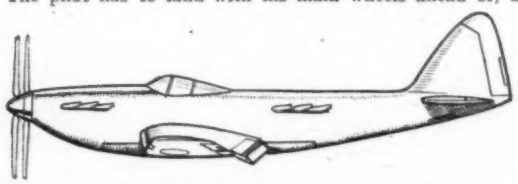
Tandem Engine Design Suggested

MAY I use some of your space to criticise Mr. G. A. Chamberlain's design for a torpedo bomber, in your issue of September 17th, and to suggest an alternative design?

I think all but the Admiralty will agree that the T.S.R. specification is now a false economy that stands in the way of efficient torpedo-bomber design. Our problem, then, is to design a carrier-borne machine capable of carrying a heavy load—two 21in. torpedoes is the obvious goal—over a relatively short distance at a high speed with adequate manœuvrability and protection, yet permitting catapult launching (?), deck-landing, small hangarage space, ease of maintenance and ease of production—sufficiently exacting requirements without complicating the issue of T.S.R. impedimenta!

Mr. Chamberlain's assumption of two 2,000 h.p. engines is obviously reasonable—the principal trouble seems to be to install them so as to give small overall width and yet easy deck-landing. The fundamental trouble with his design is the hasty way in which he dismisses the problem of the behaviour of tricycle undercarriages on a carrier's deck. Where does he propose to put his landing-hook? (Of course, brakes can effectively be used on tricycles, but with the grave risk of skidding the machine overboard!)

The pilot has to land with his main wheels ahead of, and



his hook behind, a landing cable, hence the hook must be as far back as possible, without any possibility of the cable tension capsizing the machine, or of the airscrew(s) fouling the cable. On all these counts the proposed design falls down badly. (It is significant the Airabonita, the deck-landing version of the Airacobra, has a normal undercarriage.)

The next problem is hangarage. By introducing tail booms, with the wings folding outboard of them, Mr. Chamberlain is not making the best use of the small width of the central-engine layout. He speaks of a "low-wing monoplane" (to keep the undercarriage short) with a "bulbous centre-section" to carry two 21in. torpedoes! To reconcile these two proposals with the length (nearly 20ft.) of a 21in. torpedo and the shortness (not more than 25ft.) of his nacelle, Mr. Chamberlain would have some difficulty in placing his spar(s). Unless these pass round, under or through the torpedoes, he will arrive at a mid-wing arrangement and lose the advantages of a short undercarriage plus good airscrew clearance. And the idea of deck-landing at 100 m.p.h. and over by periscope!

If we concede that speed plus fighters plus armour are better than less speed plus turret, we could have the following layout.

(1) Two liquid-cooled engines on either side of the pilot, with wing-root ducted radiators, driving concentric airscrews through extension shafts. (See the Japanese A7M1 fighter, *Flight*, December 25th, 1941.) If the two engines rotate in opposite directions, we can avoid the torque reaction controversy, which Fairey's, Rotol's and de Havilland's should have settled by this time, anyway!

The advantages of this arrangement over Mr. Chamberlain's are: (a) Airscrews clear of landing cables; (b) smaller fuselage surface (internal torpedoes, of course), and hence less skin friction; (c) possibility of smaller folded width. This retains the advantages of his "tank turret" system, except for the periscope—though a retractable cockpit might be used.

(2) Mid-wing (i.e., spars above the torpedoes) cranked (giving a short undercarriage), folding upwards at the "elbows."

(3) Normal undercarriage to comply with the present deck-landing system.

(4) Armour and flaps (Fowler or Youngman—my sketch shows the latter) *ad lib.*

I have sketched half a dozen alternative layouts, but this seems to solve the problems set with least fuss; the engine installation seems the only major design headache.

Hoping this will stimulate further discussion on this neglected type of aircraft. JAMES R. PALMER.

WEST AFRICAN INDUSTRY

Export, Rail and Roadbuilding

IN an article under the heading "R.A.F. in West Africa" which you published in the August 6th, 1942, issue of *Flight*, there occurred the following sentence: "Nevertheless, it has to be admitted that the West Coast Africans are about the laziest people in the world."

We of the West African Students' Union not only take the strongest possible objection to this thoughtless statement, but also take up the challenge completely to refute it.

What does the author of the statement know of West Africans? Let us take the example of trade and industry in West Africa. Who has been producing for over a hundred years for the consumption of Europe and other countries, unaided by any of the modern agricultural implements, palm oil, palm kernel, timber, gold, manganese, cocoa, and other such raw materials, until frequently Europe has shown her incapacity to consume them?

Take up next the case of modern development in West Africa. By whose labour were those hundreds of thousands of miles of railways built all over West Africa? Was it by the labour of the Englishman? Emphatically no! Rather it was the labour of the West Africans. Who built those tens of thousands of miles of roads, and the bridges, all over West Africa? It was the West Coast Africans.

Assuming that the intention of the author of this statement was merely to impress the British public that we West Africans show less zeal in our efforts to win the war than do the English in Britain, we will ignore the fact that some of the English people themselves in this country, like some of us Africans, do little or nothing to help the war effort. We will merely ask you and the British people to note two differences between the motives of the British people and us for doing our best.

The British war workers are being paid far higher wages than our war workers *for doing the very same work*. While the English war workers are being paid 15s. per day, ours receive only 2s. 6d. per day in most cases.

LADIPO SOLANKE, M.A., B.C.L., LL.B.,
Secretary-General and Warden,
West African Students' Union,
London.

AIRCRAFT FOR THE MIDDLE EAST

Fighters Shipped to West Africa and Flown Across the Continent to Reinforce the Desert Air Strength

A VITAL link in the supply of aircraft to Africa and the Middle East is an airfield on the British West African coast. It is here that crated machines, which have been shipped from Britain, are unpacked, erected and tested before being flown across Africa by the pilots who will later use them on operations. Making an airfield in this area was no small task because it meant clearing a vast area of virgin tropical forest before runways of sufficient strength to support modern aircraft could be built. However, with much hard work, ingenuity, enterprise and the cheerful co-operation of the West African workpeople, it was finally finished and equipped. It is obvious that this arrangement has clipped many days—even weeks—off the time taken to deliver aircraft by ship to Suez.

The Hurricane fuselage is unpacked by West African labourers and wheeled to the erection shed.

A crated Hurricane arriving at the assembly point. The road appears to be a track through the forest.

The contents of the crate—fuselage, wings, tail units, long-range fuel tanks, etc.—on their way to the erection hangar.

Above and on the right are two photographs taken during the initial stages of clearing the airfield from virgin forest. The trees which are being felled are Rumn palms. These supply the local timber for rough building.

...ding the runways. ... mechanical dum... are used here. All ... "metalling" is ...ried in baskets on ... heads of ...ourers.

A final top dressing of tar and gravel being laid on one of the runways.

...mouflage, ... the roller ... shading ...lf from the ...pical sun.

Local members of the fire-tender crew. The atmosphere in the asbestos suit must be rather stuffy to say the least.

All set, a row of Hurricanes, all fitted with long-range tanks, ready for flight testing before handing over to the pilots who will fly them to their destination.

A Hawker Hurricane on flight test adds the roar of its Merlin to the cries of the birds and animals in the surrounding forest.

Hawker Hectors towing General Aircraft Hotspur gliders in formation.

Royal Air Force and Fleet Air Arm News and Announcements

Promotion

The London Gazette, October 6*th*, 1942.

Air Cmdre. M. B. FREW, D.S.O., M.C., A.F.C., to be Act. Air Vice-Marshal. September 16th, 1942.

Retirements

The London Gazette, September 29*th*, 1942.

Grp. Capt. W. SOWREY, C.B.E., D.F.C., A.F.C., is placed on the retired list and retains the rank of Air Cmdre. September 21, 1942.

Air Vice-Marshal C. W. NUTTING, C.B.E., D.S.C., is placed on the retired list at his own request. August 30, 1942.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards for bravery and skill in air operations in the Middle East:—

DISTINGUISHED SERVICE CROSS.

Lt. (A) F. A. SWANTON, R.N.

MENTION IN DESPATCHES.

Sub. Lt. (A) I. G. TEMPLER, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards, in recognition of gallantry and devotion to duty in the execution of air operations:—

DISTINGUISHED SERVICE ORDER.

Grp. Capt. A. CONSTANTINE.—This officer has commanded his station with great distinction. Possessing exceptional qualities of leadership and efficiency, he has maintained the keenness and morale of the personnel at a very high level. The high degree of efficiency of the squadron which operates from his station is in no small measure attributable to his personal example. Since assuming command he has flown with the squadron on five occasions and on the last three of these sorties he has acted as pilot in a single pilot crew; two of these sorties were on the recent large-scale operations.

BAR TO DISTINGUISHED FLYING CROSS.

Flt. Lt. T. P. E. BARLOW, D.F.C., R.A.F.V.R., No. 44 (Rhodesia) Sqn.—This officer was awarded the D.F.C. in June, 1941. Since March, 1942, he has attacked many important enemy targets, including two attacks on the naval base at Trondheim. On one occasion he descended to 4,000 feet to release his 4,000 lb. bomb on his allotted target. During another sortie he obtained a photograph of Hamburg.

Act. Flt. Lt. H. G. HAZELDEN, D.F.C., R.A.F.V.R., No. 83 Sqn.—This officer was awarded the D.F.C. in May, 1941. Amongst the targets that he has recently attacked are Essen, Bremen, Cologne, Kiel, Hamburg and Lubeck as well as numerous other sorties over Germany and occupied France. On one occasion in April, 1942, after attacking Hamburg in adverse weather, one engine of his aircraft caught fire and became useless shortly after leaving the target area. Despite this, he skilfully flew the aircraft safely back to an airfield in this country, where he made a perfect landing. More recently he has obtained excellent photos of his targets, particularly the one secured on June 3rd 1942, during an attack on Bremen.

F/O. A. I. McRitchie, R.A.F.V.R., who has been awarded the D.F.C. He has destroyed four enemy aircraft at night. The official citation appears on page 455.

DISTINGUISHED FLYING CROSS.

Act. Wing Cdr. M. E. POLLARD, No. 14 Sqn.—This officer has carried out many different types of operations against the enemy both by day and night. In September, 1941, he led a formation of nine Blenheims on a low-level attack against tugs, and barges escorted by armed ships. In the face of a heavy barrage two barges were sunk. In the same month he led a similar formation in a low-flying attack against seven merchant vessels escorted by four armed ships, one destroyer and protected by a patrol of two Me.109s. Undeterred by the opposition a most determined attack was made and one merchant vessel was certainly sunk and another probably destroyed. On other occasions he has participated in low-level attacks on enemy airfields as well as intruder sorties.

Sqn. Ldr. I. P. GRANT, A.F.C., No. 115 Sqn.—This officer has completed numerous sorties. Included are three daylight raids against German naval activity in the Heligoland Bight in the early stages of the war; one of these was an attack against pocket battleships in the Kiel Canal area in the first days of the war. Since then he has carried out attacks on many important targets such as Brest, Wilhelmshaven, Essen, Cologne, Lubeck and Rostock. As captain of aircraft this officer has always displayed outstanding ability both as a leader and organiser, which has had a direct effect on the successes achieved. Sqn. Ldr. Grant has always been selected to open the attack, a feat he has accomplished with remarkable success. Included in his list of successful photographs is one of Essen. As usual, in this case his success was attributable to splendid team work of the crew plus his own untiring efforts to map-read successfully right up to the target, even in the face of well-directed enemy opposition. On one occasion he flew a Wellington aircraft the whole way from Hamburg to base on one engine.

Sqn. Ldr. E. D. GRIFFITHS, No. 102 Sqn.—This officer is a captain of exceptional merit who has always shown great coolness and determination in pressing home his attacks. He has completed sorties against the majority of important enemy targets, including the industrial area of the Ruhr and seaport towns such as Bremen, Kiel, Wilhelmshaven and Lorient.

Act. Sqn. Ldr. W. S. FIELDING-JOHNSON, M.C., R.A.F.V.R.—From June to September, 1940, this officer participated in many sorties involving attacks on the enemy's marshalling yards, refineries and other important targets. Thence on-

SERVICE AVIATION

wards until March, 1942, he was employed on station duties and was consequently unable to take part in active operations during that period. He participated in the "thousand bomber" raids on Cologne, the Ruhr and Bremen.

Act. Sqn. Ldr. R. A. MILES, No. 59 Sqn.—Sqn. Ldr. Miles has completed several bombing attacks on Brest and other heavily defended areas, pressing home his attacks whatever the opposition. On June 19th, 1941, he participated in a sortie against enemy shipping off Le Touquet. The attack was pressed home in the face of intense anti-aircraft fire. Sqn. Ldr. Miles dived his aircraft to almost sea level whilst taking evasive action, but it was apparently hit. The port engine propeller and nacelle struck the water, but Sqn. Ldr. Miles, displaying great presence of mind and exerting great efforts, succeeded in keeping the aircraft above the water. The propeller had been broken off and the entire reduction gear casing was shed, so hard was the impact with the water, while other damage, including the hydraulics, was sustained. Sqn. Ldr. Miles, however, climbed the aircraft slowly to 800 feet and, nursing his one good engine, skilfully flew the aircraft back to an airfield in this country, where he made a safe landing with the undercarriage retracted.

Flt. Lt. P. J. C. HARPER, R.A.F.V.R., No. 101 Sqn.—As a pilot this officer has a splendid operational record. He served in France from the beginning of the war until the middle of June, 1940. No record of his achievements is available, as his log book was destroyed in France. Since his return to this country he has completed many sorties on Battles and Wellingtons. His sorties have involved bombing attacks on enemy industrial targets and dockyard installations.

Flt. Lt. E. D. LEVIEN, R.A.F.V.R., No. 7 Sqn.—This officer has completed numerous sorties, two of which were daylight attacks. His navigation has at all times been outstanding. In one attack on the Renault Works Flt. Lt. Levien obtained hits on an important part of the factory on each of two runs over the target. Other targets attacked include Brest, Kiel, Bremen, Berlin and Essen.

Act. Flt. Lt. A. H. BAIRD, No. 26 Sqn.—This officer has invariably carried out his attacks with great determination in spite of heavy concentrations of anti-aircraft fire. His team work has been excellent and his keenness such that he was always ready to take-off whatever the weather. On one occasion, whilst attacking enemy gun positions, Flt. Lt. Baird was wounded in three places in the leg. Despite this, he continued his sortie and later returned safely to base. On being told that the operation to remove the splinters from his leg would necessitate a lengthy absence from his squadron, he refused to have this done, and, after a short stay in hospital, returned to duty eager to continue operational flying.

F/O. A. I. MCRITCHIE, R.A.F.V.R., No. 151 Sqn.—F/O. McRitchie, in one patrol, at dusk, in October, 1941, attacked four Ju. 88's, flying in formation at almost sea-level and about 50 miles from the coast. A running fight ensued and F/O. McRitchie shot down one of the enemy aircraft. Despite difficulties, he fought the others until they reached the Dutch coast. He has destroyed four hostile aircraft at night.

Act. Flt. Lt. E. E. BROWN, No. 228 Sqn.—This officer has been continuously engaged on flying duties since the war began and has completed many hours' operational flying. He has flown not only over the Atlantic and the North-Western approaches, but also over the Mediterranean and West Africa. Since the return of his squadron to home waters, Flt. Lt. Brown has been continuously engaged on anti-submarine patrols.

Flag on Arc de Triomphe

Act. Flt. Lt. A. K. GATWARD, R.A.F.V.R., No. 236 Sqn.—This officer volunteered to undertake a special and extremely hazardous mission, the object being to drop a French tricolour flag over the Arc de Triomphe in the centre of Paris in daylight. On June 12th, 1942, he took off, without cloud cover, and, flying extremely low, he reached Paris and carried out his task with complete success. Still without the assistance of cloud cover, he flew the aircraft safely over 100 miles of enemy territory and returned to this country.

Act. Flt. Lt. A. LAMBERT, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has completed a tour of operations which has included attacks on many different types of target, including Hamburg, Stettin, Wilhelmshaven, Berlin, and many others. On one flight his aircraft was airborne for 11¼ hours. As an observer, his skill and determination have at all times proved a source of confidence to all with whom he has flown.

Act. Flt. Lt. R. J. LANE, R.C.A.F., No. 35 Sqn.—This officer has displayed unshakable determination to reach his target. His skill, together with his coolness under fire, whatever the weather, has inspired his crew with extreme confidence. Some of the targets he has attacked include Berlin, Brest, Cologne and Bremen, as well as an attack on the German naval base at Trondheim.

Act. Flt. Lt. H. L. LINDO, R.C.A.F., No. 103 Sqn.—Flt. Lt. Lindo is a most experienced and dependable navigator. During the many operational sorties on which he has been engaged he has faced bad weather and enemy opposition with an unconquerable spirit of determination to complete his allotted task. Although his later work has diminished his opportunity to go on sorties, he has continually asked to take part and has flown as observer with various pilots, producing extremely good results and being involved in many dangerous situations. Flt. Lt. Lindo was once compelled to alight his aircraft on the sea. Whilst afloat in the dinghy with his crew it was bombed by an enemy aircraft before they were rescued. On this occasion his conduct under most trying conditions was of great benefit to his comrades. On another occasion his aircraft collided with high-tension cables and caught fire. Flt. Lt. Lindo acted with great coolness, helping the rest of the crew. Despite these two unnerving incidents, his enthusiasm for operations remained undiminished.

Grp. Capt. Victor Laws, Deputy Director of Photography of the Royal Air Force. Grp. Capt. Laws' association with the photographic side of the R.A.F. goes back to the last war.

Act. Flt. Lt. S. D. JONES, No. 35 Sqn.—Flt. Lt. Jones has been engaged on active operations since February, 1941. During the period he has completed numerous attacks over Germany and German-occupied territory. He took part in two low-level attacks on the naval base at Trondheim. In the face of intense opposition he carried out his attacks from only 150 feet. On three other occasions, whilst over Germany, his aircraft was attacked by night fighters. During these encounters the aircraft sustained severe damage, but each time he skilfully flew it safely back to this country with one engine out of action.

Dieppe Smoke Screen

Act. Flt. Lt. J. E. SCOTT, No. 614 Sqn.—On August 19th, 1942, Flt. Lt. Scott was the pilot of the leading aircraft of a section of three aircraft detailed to lay a smoke-screen at Dieppe. When nearing the target area, his aircraft was hit by shell-fire from an armed ship. The windscreen was shattered and the instrument panel and compass destroyed. Flt. Lt. Scott was wounded in the right leg and right arm; his right jaw was also severely lacerated. He tried to tell his formation to continue to the target but was unable to do so; consequently he led them on and then back to the English coast. On arrival there, he prepared to make an emergency landing. The starboard engine was losing power, but although unable to lower the undercarriage or flaps, or to jettison his bombs, he made a successful landing. Unfortunately, the bombs exploded and the aircraft caught fire. In spite of his injuries, Flt. Lt. Scott extricated his observer, who was unconscious, and escaped himself by rolling down the burning wing.

Act. Flt. Lt. H. SWETMAN, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Flt. Lt. Swetman, a bold and resolute captain, has inspired the confidence of all the crews with whom he has flown. He has participated in attacks on the Ruhr area and other targets, both in Germany and German-occupied territory.

F/O. W. R. BUTTERFIELD, R.A.F.V.R., No. 7 Sqn.—F/O. Butterfield has participated in many raids, including attacks on Berlin, Stettin, Hamburg, Essen and Cologne. On one occasion when his observer was wounded F/O. Butterfield skilfully rendered first aid, which probably saved his life.

F/O. G. L. FINLAYSON, R.A.F.V.R., No. 106 Sqn.—This officer has displayed navigational skill and accuracy of bombing of a high order; his results have been most noteworthy. He has taken part in sorties against most of the important targets in the Ruhr and the naval bases of Kiel, Bremen, Wilhelmshaven and Hamburg. He also participated in the "1,000" raids. In August, 1941, he was seriously injured. Following his recovery some three months later, he returned to his operational duties, which he undertook with undiminished enthusiasm. As squadron navigational officer he has contributed materially in raising and maintaining the high standard of navigation throughout the squadron.

Flt. Lt. D. B. BARNARD, No. 142 Sqn.—This officer is a sound captain with a long record of good operational work. He invariably presses home his attacks in a determined and fearless manner. His skilful airmanship has on many occasions resulted in the target being attacked successfully, despite the heaviest defences. He has made many flights to the Ruhr area.

Act. Flt. Lt. W. E. BLENCH, R.A.F.V.R., No. 57 Sqn.—As a wireless operator/air gunner, Flt. Lt. Blench has always displayed courage and resourcefulness whilst engaged on active operations, and has proved himself to be a most valuable member of aircraft crew. He has participated in raids on many of the most heavily defended targets, involving long flights over enemy and enemy occupied territory. These include such targets as Berlin, Kiel, Hanover and Genoa. On more than one occasion he has been largely instrumental in the safe return of his aircraft.

F/O. J. G. MCDONALD, R.C.A.F., No. 83 Sqn.—This officer has carried out many sorties on heavily defended targets in the Ruhr, Germany and occupied territory in France. On May 30th, 1942, he participated in the strong attack on Cologne. Whilst over the target area his aircraft was caught in a cone of searchlights and heavily engaged by the defences. Violent evasive action was taken, but he was unable to evade the searchlights and shell fire until he had descended from 16,000 feet to only 50 feet. The aircraft was extensively damaged; the hydraulic system was rendered unserviceable, the perspex of the front turret shot away, the port engine holed, and other minor damage sustained. Despite this, F/O. McDonald continued to the target, and, obtaining height, he bombed Cologne from less than 5,000 feet. Skilfully flying his damaged aircraft back to base, he executed a crash landing with the minimum damage to the aircraft.

F/O. A. C. B. MORGAN, R.A.F.V.R., No. 150 Sqn.—This officer has completed very many sorties over Germany and German-occupied territory, including several attacks on Brest, Bremen and Emden. On one occasion, in January, 1942, his aircraft was badly damaged whilst running up to the target; his front gunner was wounded at the same time. Although the hydraulic system was rendered unserviceable, causing the wheels and bomb doors to hang down, F/O. Morgan resolutely carried out his attack and bombed his objective.

F/O. J. D. WATERMAN, R.C.A.F., No. 207 Sqn.—This officer is employed as air observer/navigator. He has completed numerous sorties, a large proportion of which have been against heavily defended targets, such as Cologne, Essen, Wilhelmshaven, Brest, Bremen and Hamburg. On one occasion, whilst over Bremen his aircraft was hit by anti-aircraft fire, and F/O. Waterman was struck by fragments of shell just above both eyes. Despite this, he continued his work and navigated the aircraft safely back to base without even mentioning that he had been slightly wounded. The fact became known when he arrived in the operations room with his face covered with blood. On July 11th, 1942, on a daylight raid against Danzig he skilfully navigated his aircraft to and from the target in very bad weather.

Ground Strafing Lancaster

F/O. R. E. S. SMITH, R.A.F.V.R., No. 61 Sqn.—This officer has participated in successful bombing operations both as second pilot navigator of Hampdens and as captain of Manchester and Lancaster aircraft. He has participated in sorties against most of the main targets in Germany and German-occupied territory, including Berlin, Hamburg, Rostock, Bremen and the Renault Works, Paris. Throughout, he has achieved much success. On no less than six occasions he has descended to very low levels, whilst returning from successful bombing attacks, in order to machine-gun trains, searchlights and other ground targets.

Act. F/O. A. B. GREIG, R.A.F.V.R., No. 218 Sqn.—This officer has proved himself to be one of the most successful navigators of the squadron. During an attack on Poissy on April 2nd, 1942, his aircraft was badly damaged by light anti-aircraft [illegible]. F/O. Greig requested his captain

SERVICE AVIATION

to make a second run to enable him to release his five remaining bombs. These he dropped directly on the target.

Act. F/O. F. K. HINDLE, R.A.F.V.R., No. 114 Sqn.—This officer has carried out a large number of sorties, 11 of which have been by night. On one occasion in August, 1941, F/O. Hindle was the observer of an aircraft which was engaged with Arado sea planes off Borkum. He was wounded in the leg by a cannon shell, but, despite the pain and the resultant loss of blood, he continued to perform his duties and navigated his aircraft safely back to this country over 250 miles of sea. In December, 1941, he participated in the low-level raid on Herdla airfield in support of the Vaagso operation. On May 30th, 1942, and June 1st, 1942, respectively, he participated in intruder attacks on airfields in support of the "thousand" raid; on June 25th he took an actual part in the "thousand" raid on Bremen.

Act. F/O. J. VIVIAN, R.A.F.V.R., No. 106 Sqn.—F/O. Vivian is a navigator of exceptional ability. He has located and attacked his targets with consistent skill, obtaining a very high percentage of success. Apart from routine raids, he has taken part in the successful attacks on the Renault Factory, Rostock and Warnemunde and two of the "thousand" raids. His last operational mission was undertaken in extremely bad weather. Despite this he navigated his aircraft to Danzig and back with unerring skill.

P/O. L. F. AUSTIN, R.C.A.F., No. 57 Sqn.—P/O. Austin is a captain of outstanding merit. All his sorties have been completed with the utmost zeal, courage and determination. During a period of intensive operations this officer's unfaltering keenness was an inspiration to all. Since October, 1941, he has participated in sorties over the most important targets in enemy and enemy-occupied territory, including such places as Brest, Berlin, Kiel, Rostock and Essen.

P/O. D. J. BRIGHT, No. 156 Sqn.—As captain of aircraft this officer has shown outstanding ability. He has on all occasions pressed home his attacks with the greatest vigour in spite of the severest enemy opposition, and, at times, damage to his aircraft. He has participated in a wide range of targets, including such heavily defended areas as Brest, Hamburg, Bremen and Cologne.

On Fire Over North Sea

P/O. J. B. BURBIDGE, R.A.F.V.R., No. 115 Sqn.—On the night of July 2nd, 1942, P/O. Burbidge was the wireless operator of a Wellington detailed to attack Bremen. On the return flight shortly after crossing the Dutch coast, his aircraft was subjected to intense fire from two armed ships, and severe damage was sustained. Immediately afterwards it was attacked by a Ju.88. P/O. Burbidge, manning one of the beam guns, was able to engage the attacker. After the first attack he observed that a serious fire had developed near the main spar. He at once attempted to extinguish it. At first he was not successful, but, after the enemy aircraft had made three further attacks causing further damage, he succeeded in extinguishing the fire.

Returning to his post he effected some minor repairs to his damaged wireless set, and, from then on, kept constant communication with base. In harassing circumstances, P/O. Burbidge displayed skill and coolness which was of material assistance to his captain.

P/O. W. G. CAMPBELL, R.A.F.V.R., No. 419 (R.C.A.F.) Sqn.—In all his sorties against the enemy P/O. Campbell has displayed courage and ability of a high order. Since September, 1940, he has participated in numerous sorties involving attacks on industrial targets, dockyard installations, marshalling yards and oil refineries. For the past few months this officer has been employed as squadron signals officer and wireless operator.

DISTINGUISHED FLYING MEDAL.

Sgt. J. L. KILMISTER, No. 252 Sqn.—During the last five months this airman has displayed great ability as an observer. On numerous occasions, when it has been very difficult to contact a convoy or naval unit requiring protection, he has been especially sent on the task and has invariably succeeded. On May 15th, 1942, when flying in the leading aircraft of a formation, he was responsible for the interception of a force of enemy transport aircraft. In the ensuing engagement two Me.110s and 13 Ju.52s were shot down. Sgt. Kilmister's keen observation in this instance contributed greatly to the results obtained.

Sgt. A. J. SMITH, R.A.F.V.R., No. 38 Sqn.—(since deceased).—Sgt. Smith completed a large number of sorties and throughout his navigation and bombing were consistently good and reliable. On the night of December 27th, 1941, he was the navigator of an aircraft detailed to attack the submarine base at Salamis. Particularly bad weather prevailed, but, despite this, Sgt. Smith navigated the aircraft to the target.

Gun Positions Shot-up

Flt. Sgt. C. J. QUINN, R.C.A.F., No. 108 Sqn.—This airman is a cool and skilful air gunner. His prowess has many times caused destruction to enemy equipment and, at the same time, saved his aircraft. On two occasions, over Benghazi and Tmimi respectively, he performed excellent work by extinguishing several searchlights and silencing gun positions which were menacing his aircraft. In one instance, in November, 1941, and again in March, 1942, he used his guns most effectively, causing much destruction amongst enemy motor transport moving on the roads in the particular area. As well as performing his operational tasks, Flt. Sgt. Quinn is acting as gunnery leader and in imparting both his keenness and valuable knowledge to new gunners.

Flt. Sgt. J. L. BURNHAM, R.A.A.F., No. 10 (R.A.A.F.) Sqn.—This airman has been employed as a fitter in an operations flight since 1939. In his rôle as senior fitter his untiring efforts to retain the maximum serviceability have been outstanding and have played a good part in the successes obtained. Throughout, he has set an example which has been responsible for the high standard of morale amongst the maintenance personnel.

Flt. Sgt. P. S. O. BRICHTA, R.C.A.F., No. 419 (R.C.A.F.) Sqn.—This airman is an observer of exceptional merit. Throughout his operational tour he has displayed both efficiency and coolness which has been of the greatest assistance to his captain. On the night of June 16th, 1942, during an attack against the Ruhr, his aircraft was damaged by anti-aircraft fire; it was also attacked by an enemy fighter. The underside of the fuselage from the front turret to the observer's table caught fire but, in spite of imminent danger to the whole crew and the possibility that it would fall through the badly burned bottom of the fuselage, Flt. Sgt. Brichta immediately attempted to extinguish the flames. His subsequent accurate navigation played a large part in the eventual safe return of his aircraft to this country. Flt. Sgt. Brichta's courage and coolness in the face of danger has at all times been of a high order. Since January, 1942, he has taken part in attacks on the enemy's industrial targets and dockyard installations.

Flt. Sgt. D. A. CUMBERLAND, R.C.A.F., No. 142 Sqn.—This airman has attained a very high standard of navigation. Whatever the opposition, he has consistently obtained good results. On February 12th, 1942, he located and bombed the German warships in the Channel in most appalling weather. He has also participated in attacks against the majority of the highly defended targets in the Ruhr. Of the many operations on which he has flown only one has been abortive and that owing to technical reasons.

Flt. Sgt. J. D. DICKSON, R.C.A.F., No. 57 Sqn.—Flt. Sgt. Dickson has acted as captain of aircraft on 26 occasions. He has executed his tasks with the utmost vigour and determination. Undeterred by bad weather, he makes every effort to locate his target and to bomb it accurately. On one occasion over Stuttgart he descended to 3,000 feet to ensure success. He has participated in attacks on Brest, Hamburg, Lubeck, Rostock, Essen, Emden and many equally important targets.

Air Chief Marshal Sir Charles Portal inspecting a W.A.A.F. balloon crew.

Flt. Sgt. W. S. DOSSETT, No. 107 Sqn.—As wireless operator/air gunner, this airman has been engaged on operational flying since June, 1940. Since joining his present squadron he has completed many sorties. He has been involved in hard fighting against the enemy aircraft on not less than six occasions. In April, 1942, he assisted in the destruction of a FW.190, while a few days later he assisted in damaging a Me.109F which was attacking his aircraft and had injured his pilot. Flt. Sgt. Dossett, who has completed both day and night sorties, has proved himself a most capable wireless operator/air gunner and is possessed of a sound team spirit.

Flt. Sgt. R. C. GOODWIN, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This airman has displayed a fine record of achievement. He was employed as an observer on the formation of the squadron and participated in its first operation. Since then he has completed numerous sorties, including attacks on a wide range of targets both in Germany and German-occupied territory. Keen and conscientious, Flt. Sgt. Goodwin has set a splendid example and is only too disappointed if his crew is "stood down."

Flt. Sgt. R. C. HOCKLY, No. 149 Sqn.—This captain has executed his operational tasks with great thoroughness and determination. He has instilled his crew with the same qualities. Thus they have become a first-class fighting unit. Flt. Sgt. Hockly has participated in numerous sorties, including industrial targets in the Ruhr area as well as attacks on such targets as Brest, Stettin, Cologne, Ostend and Dunkirk. On the evening of July 16th, 1942, Flt. Sgt. Hockly participated in an attack on the submarine yards at Lubeck. Emerging from heavy cloud at about 4,500 feet, he identified his objective, which he attacked in spite of fire from the ground defences. Photographs were attempted but were not successful owing to the adverse weather, but Flt. Sgt. Hockly believes that his bombs fell across the submarine slips. Afterwards his gunners extinguished three searchlights by machine-gun fire. Flt. Sgt. Hockly's aircraft was damaged, but he flew it back safely to base.

Flt. Sgt. J. LOWE, No. 218 Sqn.—As air gunner, Flt. Sgt. Lowe has completed a large number of sorties in Blenheim and Stirling aircraft. During these operations he has been engaged in combat on no fewer than eight occasions. On one occasion whilst patrolling near Cherbourg in a formation of three Blenheims, two Me.109s were shot down as a result of the combined efforts of the three air gunners. On another occasion, during an attack on Koln, Flt. Sgt. Lowe's accurate shooting drove off enemy aircraft which attempted to attack.

Flt. Sgt. G. H. PEARCE, No. 76 Sqn.—This airman is employed as wireless operator/air gunner. His work has been of an exceptionally high standard and, on many occasions, he has rendered most valuable assistance in the navigation of his aircraft. Flt. Sgt. Pearce has participated in attacks on important enemy targets, including an attack on Berlin and attacks on the German naval base at Trondheim.

Flt. Sgt. G. H. RAINVILLE, R.C.A.F., No. 419 (R.C.A.F.) Sqn.—This airman is employed as front gunner. He has at all times displayed exemplary qualities, and his work has been completed in an unassuming yet forceful manner. By his skill and team work he has played a good part in the success of the crews with whom he has flown. Since October, 1941, he has participated in attacks on dockyard installations and industrial targets both in Germany and German-occupied territory.

Dual Pull-out

Flt. Sgt. B. L. SCHAUENBERG, R.C.A.F.—Flt. Sgt. Schauenberg is an enthusiastic and resourceful wireless operator, whose coolness is undisturbed in any circumstances. Since November, 1941, he has participated in attacks on highly important targets in Germany and German-occupied territory, including industrial towns and naval bases. On one occasion, during a raid on Brest in January, 1942, he proved of the greatest assistance to his captain. During a steep dive his captain was unable to pull out. This airman immediately went forward to help, and by their combined efforts they were able to regain control of the aircraft. The second pilot had left the aircraft by parachute, while the navigator collapsed shortly afterwards. The wireless set became unserviceable, but Flt. Sgt. Schauenberg proved his worth by skilfully navigating the aircraft back to this country. His resource and devotion to duty on this occasion was largely instrumental in the safe return of his aircraft. This airman has interested himself in the duties of all other members of the crew and could, in an emergency, competently replace any one of them.

Flt. Sgt. L. R. SAY, No. 61 Sqn.—Flt. Sgt. Say has participated in bombing operations against the majority of the main targets of Germany and German occupied territory, including Berlin, Kiel, Cologne, Rostock and the Renault Works, Paris. On one occasion, whilst returning from an attack on Karlsruhe, his aircraft was struck by lightning. The aircraft became temporarily out of control, the wireless set caught fire, and Flt. Sgt. Say was momentarily stunned. Despite this, he rendered invaluable assistance to the wireless operator in extinguishing the burning set. By his example, both in the air and on the ground, Flt. Sgt. Say has helped to maintain a high standard of morale and efficiency amongst all the air gunners of his squadron.

Flt. Sgt. I. R. SIMS, R.A.F.V.R., No. 404 Sqn.—This airman has been engaged on reconnaissance and fighter cover patrols, often executed in adverse weather. Throughout his navigational skill has contributed materially to the successes obtained. On one occasion, when his aircraft was attacked by a Ju. 88, he manned the gun in the front of the aircraft regardless of the exposed

position, thus assisting in the destruction of the attacker. Flt. Sgt. Sims, who has secured many excellent photographs, had set a splendid example.

Flt. Sgt A. SYKES, No. 35 Sqn.—Flt. Sgt. Sykes has proved himself to be a most skilful and reliable navigator. He has participated in attacks on a wide range of enemy targets, including Hamburg, Cologne, Stettin, Berlin, two daylight raids on the enemy battleships at Brest, and two low level attacks on the German naval base at Trondheim.

Flt. Sgt. C. J. TAYLOR, No. 83 Sqn.—Throughout his long operational career this airman has continually maintained a high standard of efficiency and keenness. He has at all times been of the greatest assistance to his captain, thereby contributing to the successes of the many operations in which he has participated. On one occasion during the return flight from Hamburg in a Manchester aircraft, his wireless skill greatly facilitated the safe return of the aircraft direct to an airfield in this country. Flt. Sgt. Taylor has participated in operations against the majority of the main targets in Germany and German occupied territory, including Berlin.

Flt. Sgt. J. TAYLOR, No. 209 Sqn.—As wireless operator air gunner, this airman has been engaged on operational flying, both in Lerwick and Catalina aircraft, for over two years. Although he has been involved in two accidents, which resulted in the total loss of his aircraft, he has retained his keenness and is always ready when crews have had to be formed in an emergency.

Flt. Sgt. E. R. WILLIAMSON, No. 207 Sqn.—Flt. Sgt. Williamson has proved himself to be an exceptionally keen, reliable and efficient air gunner and bomber. He has at all times displayed a complete disregard of danger and an unshakeable confidence in his ability to achieve success. During the daylight raid on the submarine yards at Danzig on 11th July, 1942, he displayed a grim determination and, in spite of bad weather and a considerable amount of accurate anti-aircraft fire, he obtained hits on the target.

Flash-bomb Photographs

Sgt. S. ALBISTON, No. 103 Sqn.—As first wireless operator, this airman has participated in numerous sorties involving attacks on the majority of the enemy's important and highly defended targets. Fearless under fire and absolutely dependable in all circumstances, he has always proved of the greatest assistance to his captain. He has interested himself in all the duties of each member of his crew, as a result of which he has assisted in obtaining good photographs by skilful co-operation between himself, using a flash bomb, and his navigator; he has also assisted his navigator to take Astro sights. He has proved himself to be one of the leading wireless operators in the squadron.

Sgt. H. B. BANKS, No. 78 Sqn.—Sgt. Banks is an extremely efficient wireless operator. Although he was wounded early in his operational career he remained undeterred by his experience and continued to display a praiseworthy eagerness for operational flying. On other occasions when his aircraft has been damaged by enemy fire, his high morale remained unshaken. His conduct in the face of the enemy and his great devotion to duty have set an outstanding example. Since June, 1941, he has participated in attacks against the majority of the enemy's industrial targets.

Sgt. W. K. DUNN, No. 115 Sqn.—On the night of June 29th, 1942, Sgt. Dunn captained a Wellington aircraft detailed to attack Bremen. On the return flight, after having successfully accomplished his bombing task, the aircraft was attacked by a Me. 110 in the vicinity of Groningen, in circumstances favourable to the attacker. Although subjected to a series of attacks Sgt. Dunn skilfully manœuvred his aircraft. He not only detracted from the effectiveness of the attacks but enabled his gunners to engage the enemy causing the attacker to break off the engagement.

Sgt. Dunn's aircraft was extensively damaged; the majority of the instruments had ceased to function, while the hydraulic system was unserviceable and the undercarriage and bomb doors were hanging down. The starboard petrol tanks were pierced, and it was necessary to pump a gallon of oil into the starboard engine every half-hour in order to maintain the oil pressure. Despite this, Sgt. Dunn flew the damaged aircraft back to base where he made a successful landing.

Sgt. Dunn has participated in numerous operational sorties involving attacks on a wide range of the enemy's most important targets, including Berlin, Brest, Wilhelmshaven and industrial targets in the Ruhr area.

L.A/C. R. K. SCOTT, R.A.A.F., No. 10 Sqn.—On May 29th, 1942, this airman was the armourer on a Sunderland aircraft making an operational flight when the port bomb rack became unserviceable, L.A/C. Scott displayed outstanding initiative and surmounted almost insuperable difficulties by transferring, with aid, four heavy bombs to the starboard rack. Thus, his captain was enabled to make a second attack on an Italian U-boat and severely damaged it. During the entire period, the aircraft was subjected to heavy anti-aircraft fire which exploded quite close to the aircraft, but this did not deter L.A/C. Scott from his self-imposed task.

During the action, numerous major gun stoppages occurred, which necessitated dismantling and dissembling the guns, but this airman dealt with them efficiently and unassisted, and although four guns were unserviceable at one period, he enabled 2,600 rounds to be fired at the enemy.

Award of Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decoration and medal, conferred on the officers and airmen indicated, in recognition of valuable services rendered in connection with the war:—

Conferred by the King of Norway

NORWEGIAN WAR CROSS.

Act. Grp. Capt. K. B. B. CROSS, D.S.O., D.F.C.
Act. Wing Cdr. J. C. MAYHEW (since deceased)
Act. Wing Cdr. F. D. S SCOTT-MALDEN, D.S.O., D.F.C., R.A.F.V.R.
Act. Sqn. Ldr. W. J. POND, M.M.
Act. Flt. Lt. H. H. KITCHENER, D.F.M., R.A.F.V.R.
W/O. A. P. REEN, D.F.M.
Flt. Sgt. N. W. KEMP.
Sgt. T. L. HUMBLE.
Cpl. R. B. COOMBER, R.A.F.V.R.

Conferred by the President of the United States of America

SOLDIER'S MEDAL.

Sgt. L. L. BARTON, R.A.A.F.
A/C.1 J. H. WALKER.

Roll of Honour

Casualty Communiqué, No. 165.

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. G. Appleyard; Sgt. R. L. Beaddie; Flt. Sgt. T. M. Brent; Sgt. T. W. Charles; Sgt. M. Darvill; Flt. Lt. C. W. W. Darwin; Sgt. J. D. Dapie; P/O. R. Filson-Young; Sgt. R. J. George; L.A/C. P. N. Howarth; L.A/C. J. C. Manning; Sgt. A. R. Vernon; Sgt. L. W. Young.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. K. Russell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. E. D. Kennedy.

WOUNDED OR INJURED IN ACTION.—P/O. P. O. Cobley; Sgt W. C. Hurrell; Sgt. J. G. McGill; Flt. Sgt. G. W. Williams.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. W. Johnson; Sgt. G. H. Lawrence; P/O. F. McCreavy.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. H. Abbas; Flt. Sgt. J. R. St. G. Arrowsmith; P/O. A. G. Bake, D.F.M.; Sqn. Ldr. K. W. Bonnar; Sgt. J. D. Brown; P/O. R. W. Charters; Sgt. J. A Evers; Act. Wing Cdr. B. Finucane, D.S.O., D.F.C.; Sgt. J. A. G. Firth; Sgt. M. Gruber; Sgt. W. G. Harrison; Sgt. R. I. Hart; Sgt. J. N. Hindle; Sgt. T. E. Hodgson; Sgt. N. H. Hood; Flt. Sgt. H. J. Humphrey; Sgt. W. L. Lambert; F/O. C. O'Brien; Act. Flt. Lt. N. Paterson; P/O. R. J. Robinson, D.F.C.; Sgt. J. T. Stainworth.

MISSING.—Sgt. W. E. Ackerman; Sgt. C. Atchison; Flt. Sgt. J. E. Bacon; Flt. Sgt. S. L. Beamont, D.F.M.; Sgt. A. J. Beattie; Sgt. S. Beaumont; Sqn. Ldr. L. G. Belchem; Sgt. F. G. A. Bick; Sgt. P. Bray; Sgt. F. V. Bretherton; Sgt. P. D. Bryne; Flt. Sgt. V. Carriline; P/O. A. F. Chesthan; P/O. J. E. Coleman; Sgt. H. O. Collins; Sgt. C. W. Cooke; Sgt. A. H. T. Davies; Sgt. J. A. Edwards; Sgt. L. D. V. Edwards; P/O. J. A. Esler; P/O. J. S. V. Fegan; P/O. A. Fennell; P/O. F. B. Franklin; F/O. A. W. Friend; Sgt. C. Gissing; Flt. Sgt. R. C. Graham; Sgt. A. T. Grossmith; Flt. Sgt. D. E. Hall; P/O. B. H. Harmer; Sgt. A. Harris; Sgt. R. Henderson; L.A/C. J. Heron; Sgt. A. J Higgins; Sgt. F. W. Holmes; Sgt. E. C. Horton; Sgt. J. J. Hughes; F/O. L. J. Jackson; Flt. Sgt. F. D. Jago; Act. Flt. Lt. W. A. R. Keddie; P/O. P. H. N. Lambert; Sqn. Ldr. H. Ledger; Flt. Sgt. R. A. Linford; Flt. Sgt. W. Lonsdale; Flt. Sgt. J. R. Ludkin; Sgt. A. S. Lush; Sgt. E. McDevitt; Sgt. F. E. Mackenzie; Sgt. G. S. Markland; Act. Wing Cdr. H. C. Mayers, D.F.C.; Sgt. L. Mitchell; Sgt. D. G. Mogg; Sgt. S. Myers; Sgt. W. R. Norley; Sgt. F. B. Pomeroy; Flt. Lt. G. H. Porter; Cpl. H. Potter; W/O. G. Robson; D.F.M.; Flt. Sgt. J. A. Shaw; Sgt. B. F. Short; Sgt. B. E. Smith; Flt. Sgt. J. N. Tew; Sgt. K. S. Watson; P/O. F. S. White; P/O. R. L. Woolley; P/O. J. A. Worswick; Sgt. F. N. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. J. H. Shearn.

KILLED ON ACTIVE SERVICE.—Sgt. W. C. Bacon; L.A/C. W. E. Barker; P/O. A. Bartlett; Flt. Sgt. P. J. W. Blake; Sgt. N. Cash; Sgt. J. W. Chadwick; L.A/C. P. C. Christian; Sgt. A. Collins; Flt. Sgt. R. L. Cunningham; Sgt. J. A. Dent; Sgt. A. Douglass; Sgt. S. Downing; Sgt. H. V. Edmonds; A/C.2 T. A. Edwards; Sgt. R. I. D. Forsyth; F/O. B. D. C. Gibson; Flt. Sgt. J. Gilles; Sgt. W. A. Glover; Sgt. G. D. Graham; A/C.1 L. Harrison; P/O. H. Hibbert; L.A/C. D. N. Jones; Sgt. S. A. Keen; Sgt. J. C. Kidd; Sgt. A. V. Langridge; Sgt. W. A. Lawson; Sgt. D. W. Lewis; L.A/C. R. O. Lloyd; L.A/C. S. G. McAlpine; Sgt. J. I. McDowell; Sgt. J. Mauthorpe; P/O. C. C. Matt; Sgt. T. C. Murray; L.A/C. L. R. Nimmo; L.A/C. H. C. Pigerham; Sgt. A. J. Russell; Sgt. R. J. Sharp; L.A/C. W. S. Stevens; Sgt. S. H. Stillwell; Flt. Sgt. J. H. F. Sydes; Sgt. C. J. Thomas; Sgt. P. M. Thurgood, P/O. J. H. Trethewy; Sgt. J. A. R. Triscott; Sgt. J. N. Wallworth; L.A/C. W. J. Webb, Sgt. A. T. Wharte; Sgt. P. S. Williams; F/O. B. Wykes.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. M. K. Brett; Sgt. P. W. S. Brooke; P/O. L. A. B. Hack; Sgt. W. D. Horn; P/O. R. K. Luddington; Sgt. B. W. Turner.

The crest of the Royal Air Force Regiment.

A glider pilot trainee getting into a Hotspur glider. The Harley light for night landings is of interest.

SERVICE AVIATION

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. W. Osterstock; Flt. Sgt. N. F. Payne.

DIED ON ACTIVE SERVICE.—Sgt. R. Berrington; L.A/C. H. Butler; Sgt. H. W. Hazell; A/C.1 J. H. Mayfield; L.A/C. E. F. Melson; A/C.2 J. L. Morgan; L.A/C. W. C. R. Pearson; A/C.2 W. J. Precious; Sgt. D. H. Stinchcombe; L.A/C. F. W. Toutt; A/C.1 A. Whitaker.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. J. R. Mason.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—FLT/O. M. C. Polglase.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. H. D. Fox; Sgt. J. W. Grimwade.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. De-M. Nelson.

MISSING.—Sgt. A. A. Bice; P/O. F. J. Breen; P/O. G. A. Dougall; Sgt. G. R. Gahan; Sgt. L. J. Sams; Sgt. J. Storey; Sgt. W. G. Taylor; Sgt. A. E. Tinkler; Sgt. I. T. Tulloh.

KILLED ON ACTIVE SERVICE.—Sgt. T. A. Rutherford; Sgt. H. N. Williams.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. G. B. Simpson; P/O. R. B. Smith.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. F. C. Duggan.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. W. Cullen; Flt. Sgt. M. P. Reece; Flt. Sgt. W. E. L. Rowthorn.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. A. McLean; F/O. K. W. B. Moodie; P/O. C. J. Porter.

MISSING.—P/O. G. McK. Beech; Sgt. W. P. Begley; Flt. Sgt. D. McG. Blott; Sgt. J. D. Creede; Sgt. D. L. Evans; Flt. Sgt. J. C. Fitzgerald; Flt. Sgt. W. G. Gibson; P/O. W. A. Haliburton; Sgt. D. A. Hall; P/O. E. E. E. Johnstone; P/O. N. L. Laing; Sgt. J. W. Macauley; Sgt. P. C. Noel; Sgt. A. J. Pottle; Sgt. L. O. Scott; P/O. W. A. Shoemaker, D.F.C.; P/O. L. N. Skinner; Flt. Sgt. H. M. Slezak; Sgt. F. W. Stewart; P/O. D. A. Street; Sgt. A. D. Swansburg; Sgt. G. R. Titus.

KILLED ON ACTIVE SERVICE.—Sgt. J. L. D. Brophy; Sgt. W. W. Craig; Sgt. H. L. Davis; Sgt. W. J. P. Grant; Sgt. H. R. Giddens; Sgt. A. M. Hornseth; Sgt. C. C. Lee; P/O. J. G. Stewart.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. H. T. Sturt.

MISSING, BELIEVED KILLED IN ACTION.—P/O. P. H. F. W. Leland; Flt. Sgt. J. Lewis.

MISSING.—P/O. E. Johnstone; P/O. J. D. Webster.

South African Air Force

MISSING.—Lt. R. A. Durose.

KILLED ON ACTIVE SERVICE.—Lt. A. K. Roskilly; 2/Lt. L. Unwin.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Air Mech. J. A. Carroll; Air Mech. D. Mulligan.

DIED ON ACTIVE SERVICE.—2/Lt. R. C. Joyner.

Casualty Communiqué No. 166.

Royal Air Force

KILLED IN ACTION.—Act. Sqn. Ldr. J. D. Humphreys, D.F.C.; W/O. D. L. McConnell.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Act. Sqn. Ldr. R. G. A. Barclay, D.F.C.

WOUNDED OR INJURED IN ACTION.—P/O. C. L. Gotch.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. V. Anson; Act. Flt. Lt. H. C. F. Bowman, D.F.C.; Sgt. H. Brown; Sgt. R. Cameron; Sgt. P. J. Donoghue; Sgt. J. E. Forster; Sgt. S. E. T. Harcourt; Sgt. S. E. F. Hatch; P/O. C. D. Hemy; Sgt. E. H. Hulatt; Sgt. V. S. Marsh; Sgt. G. Miller; Sgt. W. F. Parker; P/O. A. Pattison.

MISSING.—P/O. F. E. Allen; Sgt. N. F. Axford; Act. F/O. P. A. Ball, D.F.M.; Sgt. L. W. A. Barnard; Flt. Sgt. J. H. Bentley, D.F.M.; Flt. Sgt. T. A. Betts; Sgt. N. V. Bickerton; Sgt. G. C. Cavanach; Sgt. R. F. Churchill; Sgt. J. W. Clarke; Sgt. M. Collins; Sgt. J. J. Cooper; P/O. G. P. Corah; Sgt. H. L. Cox; Sgt. M. J. Dembrey; Sgt. J. R. Elliott; Sgt. R. Fletcher; P/O. W. A. J. Fuller; Sgt. R. E. Furnell; Sgt. H. P. Gardiner; Sgt. A. J. Greenway; Flt. Sgt. T. S. G. Grieve; Sgt. E. W. Griffiths; Sgt. E. K. Hainey; Wing Cdr. N. A. R. Halliday; Sgt. A. Hopper; Sgt. W. E. Horsfall; Flt. Sgt. K. T. Howarth, D.F.M.; Sgt. H. Huddless; Sgt. J. A. Hughes; P/O. A. E. Hull; Sgt. H. G. Jones; Sgt. A. H. Johnson; P/O. P. W. Kerry; Sgt. A. W. T. Lancaster; Sgt. T. H. Lawton; Sgt. W. R. Leitch; P/O. A. A. H. Lindley; Sgt. N. A. Long; Sgt. E. J. McCann; Sgt. C. A. B. McMullin; P/O. G. P. Marshall; Sgt. B. J. Miller; Sgt. G. A. Morgan; Sgt. V. Murray; Sgt. E. T. Prior; Sgt. G. Redhead; Act. Sqn. Ldr. F. H. Robertson; Sgt. W. D. Scott; P/O. H. Shaw; Sgt. F. J. Smith; Sgt. P. McD. Spence; Sgt. W. J. Tanner; Flt. Sgt. J. H. Timmis; Sgt. G. Turner; P/O. J. A. Wain; Sgt. W. R. Wells; Sgt. G. H. Whyte; P/O. R. K. J. Wildish; Flt. Sgt. A. E. Williams; Sgt. D. E. Wilians; Sgt. J. Wright; P/O. W. H. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. U. J. Banham; Sgt. K. Bickmore; L.A/C. G. K. Cameron; A/C.1 D. F. Curtis; L.A/C. F. A. Elliott; L.A/C. P. S. Glover; Sgt. J. S. Graham; Sgt. E. M. McCutcheom; P/O. T. M. Osborne; L.A/C. S. D. Turner; A/C.2 S. A. Whiting.

KILLED ON ACTIVE SERVICE.—Cpl. R. A. Appleby; Sgt. L. A. Clark; Sgt. W. De Martino; L.A/C. D. B. Dennis; L.A/C. J. A. Emberson; A/C.2 O. Emery; Sgt. A. Fisher; L.A/C. N. K. Good; P/O. E. Goodhead; Sgt. H. Guy; Act. F/O. J. R. L. Hill; Sgt. D. Jowett; Sgt. A. J. Linden; Sgt. W. L. McQuatters; P/O. W. H. Millar; Sgt. F. O. B. Osbourne; F/O. G. B. Penman; Sgt. J. Weatherson; Flt. Sgt. G. W. Workman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. P. E. Bruce; Sgt. B. Carter; A/C.2 E. R. Cue; L.A/C. A. Dargue; L.A/C. J. M. Doyle.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. D. W. Flatau; Sgt. J. Fletcher; P/O. A. M. Stewart.

DIED ON ACTIVE SERVICE.—A/C.1 L. Cassidy; Cpl. J. Cook; A/C.2 R. Dunnett; A/C.1 E. T. Ellison; A/C.1 A. H. Fraser; L.A/C. N. E. Glew; Cpl. A. E. Hattley; A/C.1 N. A. Keen; Sgt. W. T. McBeath; L.A/C. A. E. Pickersgill; P/O. A. C. Williams.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. F. B. Borrett; Sgt. J. A. Bowditch; Sgt. R. Henderson.

WOUNDED OR INJURED IN ACTION.—Sgt. J. L. Forrest; P/O. D. M. Fowler.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. S. Butcher.

MISSING.—Sgt. R. K. Bannear; F/O. R. P. Barker; Sgt. C. G. Bentley; P/O. G. M. Biggin; Sgt. J. S. Cameron; P/O. R. C. Carson; A/C.1 W. O. Chelman; Sgt. N. Dan; Act. Sgt. K. T. Edwards; P/O. K. McD. Ferguson; Sgt. J. A. Finlay; Sgt. M. J. Foley; Sgt. H. M. Gall; F/O. T. M. Gibson; Sgt. R. St. C. Gowdie; Sgt. G. R. Gower; P/O. R. E. Guthrie; P/O. W. L. V. Hallet; Sgt. W. H. Isle; Sgt. G. C. Keats; Act. Flt. Lt. V. F. Keyser; P/O. D. Laurenti; P/O. A. R. McEnnally; A/C.1 W. E. Menzies; Sgt. P. W. Northway; A/C.1 L. Ogg; Sgt. R. A. Penton; Sgt. J. E. Ramsey; Sgt. W. A. Ramsey; A/C.1 C. A. Rhueben; Sgt. F. R. Smith; Sgt. K. A. Smith; Sgt. W. R. Thompson; Sgt. A. R. Tonkin; Sgt. D. D. Trood; Sgt. C. L. Unsworth; Flt. Sgt. E. H. Vickers; Sgt. G. R. Watts; Sgt. L. S. Williams; Flt. Lt. E. St. C. Yeoman.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. G. H. Sawley.

KILLED ON ACTIVE SERVICE.—Sgt. B. S. Burns; Sgt. E. D. Francis; P/O. T. MacTaggart; Sgt. B. A. Schaefer.

In the Western Desert. One of the air gunners of a Boston's crew asleep under the wing. The steel helmet pillow seems a trifle Spartan.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. J. N. Brook-House; Flt. Sgt. T. Bll Hamilton; Flt. Sgt. P. G. Hemmer.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. W. C. Gordon; Sgt. D. M. McFadyen.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. C. H. Cobbett.

MISSING.—Sgt. J. Anderson; Sgt. T. J. Armstrong; Sgt. G. R. Ash; Sgt. A. L. Bachelder; Sgt. R. D. Bijur; P/O. R. G. Blamires; Sgt. H. A. Brown; Flt. Sgt. C. E. Dauphin; Flt. Lt. C. W. J. Fernie; Flt. Sgt. G. A. Firman; Sgt. R. D Gibson; Sgt. J. R. Gilbert; Sgt. G. Hall; Sgt. L. G. Harvie; Flt. Sgt. E. E. Hopper; Sgt. E. F. Hueston; Sgt. E. T. Hunking; P/O. R. M. Krefting; Sgt. D. H. Kurtz; Flt. Sgt. W. J. Kaufman; Sgt. C. L. Love; Flt. Sgt. W. J. Macaulay; P/O. I. A. J. McQueen; Flt. Sgt. A. J. Matches; Flt. Sgt. T. F. Murphy; Sgt. R. C. Pearce; Sgt. H. E. Prime; Sgt. E. G. Robertson; Flt. Sgt. R. R. Stewart; Flt. Sgt. G. J. Strutt; P/O. B. A. Thornley; Sgt. D. Wolstenholme.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. G. K. Irwin.

KILLED ON ACTIVE SERVICE.—Sgt. R MacK. Gilmour; Sgt. J. M. Henry; Sgt. O. K. L. Jensen; Sgt. A. G. W. Keene; Sgt. A. Kirby; P/O. A. E. MacGregor; P/O. W. A. Miller; Sgt. T. B. Phillips; Sgt. G. R. Phipps; Sgt. H. V. Schofield.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. H. I. Smith; Sgt. R. F. Woods.

Royal New Zealand Air Force

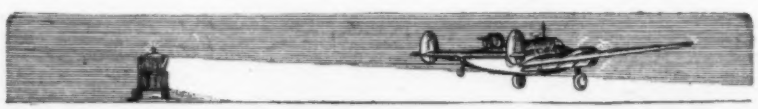
DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. R. Wallis.

MISSING.—Flt. Sgt. S. B. Goord; Sgt. W. J. Gray; Sgt. H. L. Green; Sgt. L. P. Kerr; Sgt. F. P. G. Moore, Sgt. J. I. Thomson.

KILLED ON ACTIVE SERVICE.—Sgt. B. B. Goodall; Sgt. J. S. Jones; Sgt. D. Pullinger; Flt. Sgt. S. L. Vinten.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. L. Williams.

South African Air Force

KILLED IN ACTION.—Lt. S. M. Hope; Lt. D. E. H. Kitchin; Lt. W. I. Vine

WOUNDED OR INJURED IN ACTION.—Lt. W. D. Gray; Capt. R. Clifton.